

STATUS REVIEW UPDATE  
AND ESTABLISHMENT OF  
DEMOGRAPHIC MONITORING STUDIES:  
Penstemon lemhiensis



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AND ESTABLISHMENT OF  
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Penstemon lemhiensis

Prepared for:

U.S.D.A. FOREST SERVICE - REGION 1  
BEAVERHEAD AND BITTERROOT NATIONAL FORESTS  
MONTANA

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## I. INTRODUCTION

This report represents an update to the status review of Penstemon lemhiensis (Shelly 1987), a sensitive plant species that occurs on the Beaverhead and Bitterroot National Forests in Montana. Additional field surveys were conducted during the summer of 1989, in areas on the Beaverhead National Forest that had not previously been studied. Also, surveys were conducted on the Bitterroot National Forest, to attempt relocation of two historical records in southern Ravalli County, and to survey for new populations in that region.

These surveys resulted in the discovery of ten new P. lemhiensis populations in Beaverhead County (one wholly, and one partially, on Beaverhead National Forest lands), and two new populations in Ravalli County (one wholly, and one partially, on Bitterroot National Forest lands). In addition, it is believed that the two historical locations (originally documented in 1950 and 1952) were relocated during the surveys in Ravalli County; both of these sites are located on private lands.

Additionally, permanent demographic monitoring transects were established in three locations on the Beaverhead National Forest. Two transects were installed in the French Creek drainage, and one near Badger Pass. The purpose of these studies will be to provide long-term data on the survival and fecundity of P. lemhiensis populations, and to allow assessment of natural and man-caused impacts on them.

## II. SPECIES INFORMATION

### A. REVIEW OF PRESENT STATUS

1. **FEDERAL STATUS:** Currently, P. lemhiensis is included in Category 2 of the U.S. Fish and Wildlife Service Notice of Review (U.S. Department of Interior 1985), under consideration for federal listing as a threatened species. Category 2 taxa are those "...for which information now in possession of the Service indicates that proposing to list them as endangered or threatened species is possibly appropriate, but for which substantial data on biological vulnerability and threat(s) are not currently known or on file to support the immediate preparation of rules."

In addition, P. lemhiensis is currently included on the U.S. Forest Service Region 1 sensitive species list (U.S. Department of Agriculture 1988; Reel et al. 1989). Sensitive species are "...those plant and animal species identified by the Regional Forester for which population viability is a concern, as evidenced by:





a.) (s)ignificant current or predicted downward trends in population numbers or density," and/or "b.) (s)ignificant current or predicted downward trends in habitat capability that would reduce a species' existing distribution" (Reel et al. 1989). Through its inclusion on the Region 1 sensitive species list, P. lemhiensis has legal protection under U.S. Forest Service agency policies (W. Ruediger, pers. comm.).

2. **STATE STATUS:** In Montana, P. lemhiensis is currently ranked as S2 ("imperiled in state because of rarity") by the Montana Natural Heritage Program (Shelly 1989). It was recommended for listing as "threatened" (any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range in the state) by the Montana Rare Plant Project (Lesica et al. 1984). These state rankings do not currently provide any direct legal protection for P. lemhiensis.

#### B. UPDATE OF GEOGRAPHICAL DISTRIBUTION (MONTANA)

1. **BEAVERHEAD COUNTY:** Prior to 1989, Penstemon lemhiensis had been recently documented (1986-1988) from 18 sites in Beaverhead County. During 1989, extensive surveys resulted in the discovery of 12 new populations. One recent report could not be verified as to identification (Medicine Lodge Creek, 022), and one historical collection (021: "West of Big Hole Battlefield," 1947, F.H. Rose (3502), MONTU) has not been relocated.
2. **RAVALLI COUNTY:** Prior to 1989, two historical records were known from Ravalli County (1950 and 1952). It is believed that the 1989 surveys resulted in the rediscovery of these populations. Also, two previously unrecorded populations were found.

Thus, P. lemhiensis is now known from 34 locations in Montana (30 in Beaverhead County, 4 in Ravalli County). Element occurrence print-outs for the rediscovered historical sites, as well as the newly documented populations, are provided in Section V, pp. 23-38. The locations for all of these sites are indicated on the maps in Section V, pp. 39-51.

#### C. POPULATION MONITORING AND DEMOGRAPHY STUDIES

1. **KNOWN POPULATIONS RESURVEYED IN 1989:** Eight previously documented populations (002, 003, 005, 009, 012, 014, 019, 020) were revisited in 1989;



the element occurrence print-outs, containing revised location and population data, are included in Section V, pp. 15-22. Of these eight, drastic decreases in population size were noted in three of them (Badger Pass (005), Red Butte (012), Ermont Gulch (014)). At Badger Pass, 190 plants were counted in 1986, approximately 75 of which were within an exclosure constructed to protect part of the population. During 1989, however, only 5-10 plants were observed, most of them on a roadbank; none were found within the exclosure. Similarly, 142 plants were counted in the main subpopulation at Red Butte in 1986; no plants were found there in 1988, and only ca. 12 plants were seen in 1989. Seventy-six plants were counted in the Ermont Gulch population in 1986, but only one plant was observed in 1989. The reasons for these declines are unknown; many of the plants may have been dormant in 1989, or they may have actually been extirpated. Monitoring of these sites should be continued, to determine whether these observed declines are permanent.

An increase in population size was noted at the Dutch Creek (035) site; during 1987, only one plant was observed there, on an open roadbank; searches in undisturbed habitat on slopes above the road did not reveal any other plants. In 1989, approximately 28 plants were located in the same area. This information suggests that observed population size may fluctuate from year to year if the plants can in fact be periodically dormant.

2. **NEW AND HISTORICAL POPULATIONS LOCATED IN 1989:** Details regarding population size for the 14 newly discovered occurrences, and the two historical records believed to have been rediscovered, are summarized in Table 1.
3. **DEMOGRAPHIC MONITORING TRANSECTS:** During 1989, three permanent monitoring transects were established on the Beaverhead National Forest. The purpose of these transects is to provide more detailed data on the life history and population dynamics of P. lemhiensis. Data on survivorship and reproduction are important for understanding the biology of rare plant species, and undertaking measures to ensure their long-term preservation (Massey and Whitson 1980). These data may also provide information pertaining to the small average population size of P. lemhiensis throughout its range in Montana, and the impacts that management activities (livestock grazing, mining, road maintenance) may be having on the



TABLE 1. Size of Penstemon lemhiensis populations newly documented in 1989.BEAVERHEAD COUNTY:

Occurrence number: 023  
 Site name: MINER CREEK  
 Acreage: 10  
 Population size and condition: UNCOMMON, 17 PLANTS.

Occurrence number: 024  
 Site name: FROG CREEK  
 Acreage: 1  
 Population size and condition: 26 PLANTS.

Occurrence number: 025  
 Site name: BRISTON LANE  
 Acreage: 10  
 Population size and condition: 110 PLANTS.

Occurrence number: 026  
 Site name: SWAMP CREEK  
 Acreage: 3  
 Population size and condition: 23 PLANTS.

Occurrence number: 027  
 Site name: HORSE PRAIRIE GUARD STATION  
 Acreage: 1  
 Population size and condition: VERY SMALL POPULATION, ONLY 3 PLANTS.

Occurrence number: 028  
 Site name: BLOODY DICK CREEK I  
 Acreage: 2  
 Population size and condition: 34 PLANTS, FOUR SMALL SUBPOPULATIONS.

Occurrence number: 029  
 Site name: BLOODY DICK CREEK II  
 Acreage: 2  
 Population size and condition: 22 PLANTS, FOUR SMALL SUBPOPULATIONS.

Occurrence number: 032  
 Site name: POLARIS  
 Acreage: 1  
 Population size and condition: POPULATION OF 50+ PLANTS.

Occurrence number: 033  
 Site name: SHALE CREEK  
 Acreage: 1  
 Population size and condition: POPULATION OF ONLY 2 PLANTS.

Occurrence number: 034  
 Site name: BLOODY DICK CREEK III  
 Acreage: 15  
 Population size and condition: 74 PLANTS IN 3 SUBPOPULATIONS.



Occurrence number: 035  
Site name: DUTCH CREEK  
Acreage: 12  
Population size and condition: CA. 30 PLANTS IN 2 SUBPOPULATIONS.

Occurrence number: 036  
Site name: BLANCHARD POND  
Acreage: 1  
Population size and condition: 61 PLANTS COUNTED.

RAVALLI COUNTY:

Occurrence number: 004  
Site name: NORTH FORK RYE CREEK  
Acreage: 3  
Population size and condition: TWO SUBPOPULATIONS; 72 PLANTS (SOUTH), WITH 65 ON SLOPE ABOVE ROADCUT; 11 PLANTS (NORTH), ALL ON ROADCUT; LARGEST POPULATION KNOWN IN RAVALLI COUNTY (PROBABLE RELOCATION OF 1952 HISTORICAL RECORD).

Occurrence number: 007  
Site name: MEDICINE TREE CREEK  
Acreage: 2  
Population size and condition: 10 PLANTS OBSERVED, 7 ON ROADCUT, 3 ON SLOPES ABOVE (POSSIBLE RELOCATION OF 1950 HISTORICAL RECORD).

Occurrence number: 030  
Site name: SPRING GULCH  
Acreage: 1  
Population size and condition: FOUR PLANTS OBSERVED; ONE FLOWERING, 3 STERILE ROSETTES.

Occurrence number: 031  
Site name: ROBBINS GULCH  
Acreage: 5  
Population size and condition: 14 PLANTS OBSERVED, IN 5 SMALL COLONIES; 8 FLOWERING, 6 ROSETTES, ONE PLANT ON ROADSIDE.





viability of those populations.

- a. **STUDY SITES:** The locations and geographic details for each of the three transect locations, all in Beaverhead County, are as follows:

- i. French Creek - Park Mine: French Creek drainage, on slope above west side of French Creek-Thief Creek Road (Beaverhead National Forest Rd. #606), 0.08 mi. south of junction with Trout Creek Road (Rd. #606-A), uphill from junction of Rd. #606 and the spur road to Park Mine; T6S, R11W, Sec. 1, NE $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ ; elevation ca. 7,180 ft. 50° from start pin to junction of French Creek-Thief Creek and Trout Creek roads; 113° to junction of French Creek-Thief Creek Road and Park Mine spur road.

Transect line bearing: 8°

Slope: 22°

Aspect: 105°

Direction: Transect read south to north, on uphill side of tape.

- ii. French Creek - Discovery Mine: French Creek drainage, on slope above west side of French Creek-Thief Creek Road (Beaverhead National Forest Rd. #606), 0.1 mi. south of Discovery Mine, 0.85 mi. north of Red Gulch, 1.6 mi. north of junction with Kelley Dam Road; T6S, R11W, Sec. 11, SW $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ ; elevation ca. 6,940 ft. 74° from start pin to rock outcrop across drainage to the east; 132° to juniper ca. 3 m from start pin.

Transect line bearing: 253°

Slope: 38°

Aspect: 54°

Direction: Transect read from downhill to uphill, on south side of tape.

- iii. Badger Pass North: Southern Pioneer Mountains, 0.7 air mi. NNE. of Badger Pass, 0.6 air mi. east of Beaverhead National Forest Rd. #7467; T7S, R11W, Sec. 9, SE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ ; elevation ca. 6,980



ft. 123° from start pin to short, triple-stemmed Douglas-fir; 14° to highest timbered knoll across valley to the northeast; 240° to limber pine ca. 4 m from start pin; start pin is at a bearing of 60° from top of knoll to the west.

Transect line bearing: 31°

Slope: 18°

Aspect: 106°

Direction: Transect read from west to east, on uphill side of tape.

- b. **METHODS:** The three permanent belt transects were established on 27-28 July 1989, following the methods outlined in Lesica (1987). The two French Creek transects consist of 25 adjacent 1 m<sup>2</sup> plots, and the Badger Pass North transect consists of 50 such plots. The start and end points of each transect were marked with steel rebar pins driven into the ground, and painted orange. Individuals were mapped on diagrams of each plot, and characterized using the following codes:

S = seedling (cotyledons evident, or rosette less than 15 mm diameter)

R = rosettes (basal tufts of leaves, on mature plants)

I = inflorescences (flowering stems)

F = fruits

A = aborted flowers (no apparent formation of fruits)

The total number per plant for each life history characteristic was also recorded (except for seedlings); thus, a plant with 5 basal rosettes, 2 inflorescences, 17 fruits, and 25 aborted flowers was recorded as R<sub>5</sub>I<sub>2</sub>F<sub>17</sub>A<sub>25</sub>. At the Badger Pass North site, four individuals were recorded as "C" (established immature plants, with 4 or fewer leaves);



however, these were counted as  $R_1$  individuals in the data analysis. At each of the three study sites, 25 fruits were collected from randomly selected individuals outside the transects. The fruits were dissected, and the number of viable-appearing seeds in each was recorded.

- c. **RESULTS AND DISCUSSION:** A summary of the population density and fecundity data collected in 1989 is presented in Table 2. In the three transects, a total of 240 plants were mapped and scored. The French Creek-Park Mine site had the highest recorded density, and the individuals at this site also had the highest percentage of fruiting plants. The lowest density, and the lowest average numbers of fruits per plant and per inflorescence, were recorded at the French Creek-Discovery Mine site. This site also had the highest percentage of browsed stems; it appeared that this browsing was by native species (probably deer). Very few seedlings were observed in general, and none were found in the French Creek-Discovery Mine transect. Those observed (4 at French Creek-Park Mine, 13 at Badger Pass North) were very small, and it is possible that others within the transects were missed during the studies. Also, numerous seedlings may perish or become dormant earlier in the growing season, as the habitats become drier. Seedlings of Silene spaldingii, a rare perennial plant species occurring in northwestern Montana, become dormant during the summer months under greenhouse conditions (Lesica 1988).

4. **AREAS SURVEYED BUT SPECIES NOT LOCATED:** The following areas were surveyed for Penstemon lemhiensis in 1989, but the species was not located within them. The actual areas surveyed are smaller than the portions of the sections indicated.

#### OWNERSHIP

##### Beaverhead County:

T02S R17W Sec 34 NE $\frac{1}{4}$ of SE $\frac{1}{4}$	USFS
T03S R16W Sec 07 SE $\frac{1}{4}$ of SW $\frac{1}{4}$	Private



TABLE 2. Population density and fecundity data for Penstemon lemhiensis in long-term monitoring transects, Beaverhead National Forest, 1989.

TRANSECT	FRENCH CREEK- PARK MINE	FRENCH CREEK- DISCOVERY MINE	BADGER PASS NORTH
Total # plots/transect	25	25	50
Total # plants/transect	88	35	117
Density (plants/m <sup>2</sup> )	3.5	1.4	2.3
Total # plants fruiting/transect	29	8	23
Total # fruits/transect	481	97	441
% plants fruiting	32.9	22.9	19.7
Avg. # fruits/fruiting plant	16.6	12.1	19.2
Avg. # fruits/inflorescence	11.2	8.1	13.8
% plants with one rosette*	30.7	22.9	14.6
% plants with > one rosette	64.8	77.1	74.4
% one-rosette plants with fruit	11.1	0	11.8
% multi-rosette plants with fruit	45.6	29.6	24.1
% flowering stems browsed	23.2	47.8	3.0
% aborted flowers	N.R.	N.R.	52.4
avg. # seeds/fruit (s.d.)	32.7 (11.2)	34.0 (10.3)	36.0 (12.1)
Total # seedlings/transect	4	0	13

N.R. = not recorded in 1989.

\*Rosette = cluster of basal leaves of a mature plant.





T03S	R17W	Sec 13	SE $\frac{1}{4}$	of NW $\frac{1}{4}$	Private
T03S	R17W	Sec 23	NW $\frac{1}{4}$	of NE $\frac{1}{4}$	Private
T04S	R16W	Sec 17	SW $\frac{1}{4}$	of SW $\frac{1}{4}$	BLM
T04S	R16W	Sec 29	SE $\frac{1}{4}$	of NW $\frac{1}{4}$	Private
T04S	R16W	Sec 29	NE $\frac{1}{4}$	of NW $\frac{1}{4}$	Private
T05S	R16W	Sec 36	SE $\frac{1}{4}$	of SE $\frac{1}{4}$	State
T06S	R15W	Sec 28	SW $\frac{1}{4}$	of SE $\frac{1}{4}$	Private
T06S	R16W	Sec 12	NW $\frac{1}{4}$	of NW $\frac{1}{4}$	USFS
T07S	R15W	Sec 04	NW $\frac{1}{4}$	of SW $\frac{1}{4}$	USFS
T09S	R14W	Sec 16	E $\frac{1}{2}$	of NW $\frac{1}{4}$	USFS
T10S	R15W	Sec 09	SE $\frac{1}{4}$	of SE $\frac{1}{4}$	USFS
T11S	R12W	Sec 25	NE $\frac{1}{4}$	of SW $\frac{1}{4}$	BLM
T11S	R14W	Sec 23	SE $\frac{1}{4}$	of NE $\frac{1}{4}$	State
T11S	R14W	Sec 26	NE $\frac{1}{4}$	of NW $\frac{1}{4}$	State
T12S	R12W	Sec 02	SW $\frac{1}{4}$	of NW $\frac{1}{4}$	Private\BLM
T12S	R12W	Sec 22	SE $\frac{1}{4}$	of SE $\frac{1}{4}$	BLM
T12S	R14W	Sec 03	SW $\frac{1}{4}$	of NE $\frac{1}{4}$	BLM
T14S	R10W	Sec 31	NE $\frac{1}{4}$	of SW $\frac{1}{4}$	BLM
T14S	R10W	Sec 33	SE $\frac{1}{4}$	of SW $\frac{1}{4}$	BLM
T14S	R11W	Sec 05	NW $\frac{1}{4}$	of SW $\frac{1}{4}$	BLM
T14S	R11W	Sec 06	SE $\frac{1}{4}$	of NE $\frac{1}{4}$	BLM
T14S	R12W	Sec 13	E $\frac{1}{2}$	of SE $\frac{1}{4}$	BLM
T14S	R12W	Sec 24	NE $\frac{1}{4}$	of NE $\frac{1}{4}$	BLM
T15S	R10W	Sec 07	SE $\frac{1}{4}$	of NW $\frac{1}{4}$	Private
T15S	R10W	Sec 21	SW $\frac{1}{4}$	of NE $\frac{1}{4}$	BLM
T15S	R10W	Sec 27	NE $\frac{1}{4}$	of NW $\frac{1}{4}$	USFS
T15S	R11W	Sec 24	NE $\frac{1}{4}$	of SW $\frac{1}{4}$	Private
T16S	R11W	Sec 02	SE $\frac{1}{4}$	of NW $\frac{1}{4}$	USFS
T16S	R11W	Sec 10	SW $\frac{1}{4}$	of NW $\frac{1}{4}$	USFS
T16S	R11W	Sec 11	W $\frac{1}{2}$	of SE $\frac{1}{4}$	USFS
T16S	R11W	Sec 11	W $\frac{1}{2}$	of NE $\frac{1}{4}$	USFS
T16S	R11W	Sec 14	NW $\frac{1}{4}$		USFS

#### Ravalli County:

T1N	R18W	Sec 6	NW $\frac{1}{4}$		USFS
T1N	R19W	Sec 6	SW $\frac{1}{4}$ NE $\frac{1}{4}$ , SE $\frac{1}{4}$ NW $\frac{1}{4}$		USFS
T1N	R19W	Sec 7	N $\frac{1}{2}$ SW $\frac{1}{4}$ , S $\frac{1}{2}$ NW $\frac{1}{4}$		USFS
T1N	R20W	Sec 1	E $\frac{1}{2}$ SE $\frac{1}{4}$		USFS
T2N	R18W	Sec 31	W $\frac{1}{2}$		USFS
T2N	R20W	Sec 16	SW $\frac{1}{4}$ SW $\frac{1}{4}$		State
T2N	R20W	Sec 17	SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$		Private
T2N	R20W	Sec 21	NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$		Private
T3N	R19W	Sec 30	SW $\frac{1}{4}$ , NW $\frac{1}{4}$ NW $\frac{1}{4}$		USFS
T3N	R20W	Sec 24	E $\frac{1}{2}$ SW $\frac{1}{4}$ , SE $\frac{1}{4}$ , NE $\frac{1}{4}$		USFS/Private
			NW $\frac{1}{4}$ SW $\frac{1}{4}$		
T3N	R20W	Sec 25	E $\frac{1}{2}$		USFS

### III. ASSESSMENT AND MANAGEMENT RECOMMENDATIONS

- A. **THREATS TO NEWLY LOCATED POPULATIONS:** The average population size for the 16 populations newly documented in 1989 was 35 individuals; the populations ranged in size from 2 to 110 plants. The sparsely scattered



nature of the populations, and their intrinsically small size, may predispose many of them to extirpation.

Of these 16 new populations, ten were found along disturbed roadbanks (007, 024, 027, 028, 029, 032, 033, 034, 035, 036); the size of these roadside populations ranged from two to 74 plants. Although these findings indicate that P. lemhiensis has some ability to colonize disturbed habitats, it is never found in abundance in these unnatural situations. These roadside populations should be considered very ephemeral, as such habitats are subject to frequent maintenance activities (road grading, herbicide spraying, etc.).

The six new populations that occur in native habitats (004, 023, 025, 026, 030, 031) range in size from four to 110 plants. Three of these six populations are in areas that have been seriously impacted by exotic weed invasion. The two native sites in Ravalli County have been especially impacted by Centaurea maculosa (spotted knapweed). In one case (Spring Gulch (030)), the population consisted of only four plants in 1989; it is possible that knapweed is causing the extirpation of this population.

- B. **MANAGEMENT RECOMMENDATIONS:** Land ownership for the populations discovered in 1989 is as follows (BT=Bitterroot National Forest; BV=Beaverhead National Forest). Print-outs providing details on these sites are provided on pp. 25-38.

Population number	<u>USFS</u>	<u>BLM</u>	<u>Private</u>
023	X (BV)		
024		X	X
025			X
026			X
027		X	
028		X	X
029		X	X
030	X (BT)		
031	X (BT)		X
032			X
033			X
034			X
035	X (BV)	X	
036			X

All appropriate Beaverhead and Bitterroot National Forest personnel should be notified of the populations currently found on U.S. Forest Service lands. This is especially important for personnel involved in road maintenance and weed control activities.



The French Creek population (009) is the largest one known in Montana (1,845 plants, 13 subpopulations). The habitat is in an area of historic and recent mining activity. Because this is a substantial, viable population in mostly native habitat, all future management activities in the area should be assessed, to determine potential impacts on P. lemhiensis.

Ongoing studies of P. lemhiensis continue to reveal that the species consists of small populations, many of which are vulnerable to management activities. In addition, drastic declines in population size appear to have occurred in several populations occupying natural or semi-natural habitats. These factors indicate that Penstemon lemhiensis should be retained on the U.S. Forest Service Region 1 sensitive species list.

C. PROPOSALS FOR FUTURE STUDIES: The following recommendations are made regarding continuation of field and demographic monitoring studies of P. lemhiensis:

1. Monitoring of known populations, especially those that appear to have suffered serious declines over the last four years.
2. Continuation of the demographic monitoring studies in 1990, including rereading the transects established in 1989, and establishing three additional transects within suitable populations.
3. Field surveys for new populations in suitable potential habitat, as funding and project delimitation allow.



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## V. ELEMENT OCCURRENCE PRINT-OUTS AND MAPS



PENSTEMON LEMHIENSIS  
LEMHI BEARDTONGUE

Element occurrence code: PDSCR1L3N0.002

Global rank: G3      Forest Service status: SENSITIVE LIST  
State rank: S2

Survey site name: TRAIL CREEK  
County: Beaverhead

USGS quadrangle: EVERSON CREEK  
LEMHI PASS

Township-range: 010S014W Section: 18  
Township-range comments: S2,17SW4,19NW4;T10SR15W:24NE4

Survey date: 1986-06-22	Elevation: 6520
First observation: 1970	Slope/aspect:
Last observation: 1989-06-29	Size (acres): 13

Location:

TRAIL CREEK, ALONG ROAD TO LEMHI PASS (BEAVERHEAD N.F. RD.  
3909.2), CA. 3.5-4.5 AIR MI. ESE. OF LEMHI PASS.

Element occurrence data:

70-100 PLANTS, 6 SUBPOPULATIONS; IN FULL FLOWER; MOST PLANTS  
OCCUR ALONG ROADSIDE.

General site description:

SANDY TO GRAVELLY LOAM SOILS, ON ALLUVIAL FAN AND ALONG  
ROAD; ARTEMISIA TRIDENTATA/POA SECUNDA, WITH BROMUS  
TECTORUM, SITANION HYSTRIX, CHRYSOTHAMNUS NAUSEOSUS AND  
ERIOGONUM OVALIFOLIUM VAR NEVADENSE.

Land owner/manager:

PRIVATELY OWNED LAND (INDIVIDUAL OR CORPORATE)

Comments:

VOUCHERS-WATSON, T.J. (1279), 1976, MONTU; STICKNEY, P.F.  
(2107), 1970, MONT; SCHARSBERGER, L.A. (299), 1989.

Information source:

SHELLY, J.S. 1986. FIELD SURVEYS IN BEAVERHEAD COUNTY OF  
18-22 JUNE; SCHARSBERGER, L.A. 1989. FIELD SURVEY OF  
SOUTHWEST MONTANA, 26-30 JUNE.



PENSTEMON LEMHIENSIS  
LEMHI BEARDTONGUE

Element occurrence code: PDSCR1L3N0.003

Global rank: G3      Forest Service status: SENSITIVE LIST  
State rank: S2

Survey site name: LEMHI PASS  
County: Beaverhead

USGS quadrangle: LEMHI PASS

Township-range: 010S015W    Section: 15  
Township-range comments: SE4NW4, NE4SE4, 14SW4

Survey date:	1986-06-22	Elevation:	6960
First observation:	1983	Slope/aspect:	
Last observation:	1989-06-29	Size (acres):	15

Location:

NORTH SIDE OF LEMHI PASS ROAD (BEAVERHEAD N.F. RD. 3909.2),  
1.0-1.6 AIR MILES SE. OF LEMHI PASS, CA. 1.4-2.0 MILES WEST  
OF SELWAY RANCH.

Element occurrence data:

164 PLANTS COUNTED, 3 SUBPOPULATIONS; CA. 90% OF THE PLANTS  
OCCUR ON NATIVE SAGEBRUSH SLOPES ABOVE THE ROAD; SPECIES  
OCCURS IN MORE OPEN, GRAVELLY AREAS.

General site description:

GRAVELLY LOAM SOILS, ON SW. TO SE.-FACING SLOPES; ARTEMISIA  
TRIDENTATA/FESTUCA IDAHOENSIS, WITH PHACELIA HETEROPHYLLA,  
BROMUS TECTORUM, LUPINUS, PHLOX, POA, ACHILLEA, ROSA,  
MAHONIA REPENS, GERANIUM VISCOSISSIMUM, HELIANTHELLA  
UNIFLORA, ERIOGONUM UMBELLATUM VAR INTECTUM AND VAR  
SUBALPINUM.

Land owner/manager:

PRIVATELY OWNED LAND (INDIVIDUAL OR CORPORATE)

Comments:

VOUCHER-SHELLY, J.S. (1155) AND G.V. KING, 1986, MONTU;  
SCHASSBERGER, L.A. (302), 1989.

Information source:

SCHASSBERGER, L.A. 1989. FIELD SURVEYS OF SOUTHWEST MONTANA,  
26-30 JUNE (PENSTEMON LEMHIENSIS).



PENSTEMON LEMHIENSIS  
LEMHI BEARDTONGUE

Element occurrence code: PDSCR1L3N0.005

Global rank: G3      Forest Service status: SENSITIVE LIST  
State rank: S2

Survey site name: BADGER PASS  
County: Beaverhead

USGS quadrangle: BANNACK

Township-range: 007S011W    Section: 22  
Township-range comments: N2NW4

Survey date: 1986-06-20	Elevation: 7260
First observation: 1972	Slope/aspect:
Last observation: 1989-06-14	Size (acres): 10

Location:

1.45 AIR MILES SSE. OF BADGER PASS, ADJACENT TO MICROWAVE  
TOWER ON GRAVEL ROAD 1.3 AIR MI. S. OF BIG HOLE ROAD (ST.  
HWY. 278), CA. 4.5 AIR MI. NNE. OF BANNACK.

Element occurrence data:

1986: 190 PLANTS COUNTED; CA. 75 PLANTS ARE WITHIN A FENCE  
EXCLOSURE, WHICH WAS CONSTRUCTED TO PROTECT PART OF THE  
POPULATION. 1989: VERY FEW PLANTS OBSERVED, AND NONE FOUND  
INSIDE EXCLOSURE.

General site description:

GRAVELLY LOAM SOILS, E. TO NE. ASPECT; ARTEMISIA TRIDENTATA/  
PSEUDOTSUGA MENZIESII/FESTUCA IDAHOENSIS/AGROPYRON SPICATUM,  
LUPINUS LEUCOPHYLLUS, ANTENNARIA MICROPHYLLA, GEUM, SEDUM.

Land owner/manager:

BLM: DILLON RESOURCE AREA, BUTTE DISTRICT

Comments:

VOUCHERS-SHELLY, J.S. (1147) AND G.V. KING, 1986, MONTU;  
KOVALCHICK, B.L., 1972, MONTU.

Information source:

SHELLY, J.S. 1986. FIELD SURVEYS IN BEAVERHEAD COUNTY OF  
18-22 JUNE.





PENSTEMON LEMHIENSIS  
LEMHI BEARDTONGUE

Element occurrence code: PDSCR1L3N0.009

Global rank: G3      Forest Service status: SENSITIVE LIST  
State rank: S2

Survey site name: FRENCH CREEK  
County: Beaverhead

USGS quadrangle: ERMONT

Township-range: 006S011W    Section: 11  
Township-range comments: E2,14NE4NW4,2SE4SE4,1W2SW4

Survey date:	1986-06-19	Elevation:	7000
First observation:	1986	Slope/aspect:	
Last observation:	1989-07-27	Size (acres):	40

Location:

PIONEER MOUNTAINS, SLOPES ALONG WEST SIDE OF FRENCH CREEK,  
ALONG THE FRENCH CREEK-THIEF CREEK ROAD (BEAVERHEAD N.F. RD.  
#606) 4 AIR MILES NW. OF ARGENTA; ALSO, MOUTH OF RED GULCH.

Element occurrence data:

138 PLANTS COUNTED (CA. 150 TOTAL) IN MAIN POPULATION, WITH  
22 PLANTS COUNTED IN SUBPOPULATION AT THE MOUTH OF RED GULCH  
(1986); 1845 PLANTS, IN 13 SUBPOPULATIONS, COUNTED IN 1988  
(K. SCOW); AREA SUBJECT TO MINING DISTURBANCE; TWO  
MONITORING TRANSECTS ESTABLISHED IN 1989.

General site description:

STEEP, E. & SE.-FACING SLOPES, IN GRAVELLY LOAM SOILS;  
ARTEMISIA TRIDENTATA/FESTUCA IDAHOENSIS/AGROPYRON SPICATUM,  
WITH JUNIPERUS SCOPULORUM, PSEUDOTSUGA MENZIESII, ARTEMISIA  
FRIGIDA.

Land owner/manager:

BEAVERHEAD NATIONAL FOREST, DILLON RANGER DISTRICT

Comments:

VOUCHER-SHELLY, J.S. (1130) AND G.V. KING, 1986, MONTU.

Information source:

SHELLY, J.S. 1986. FIELD SURVEYS IN BEAVERHEAD COUNTY OF  
18-22 JUNE.



PENSTEMON LEMHIENSIS  
LEMHI BEARDTONGUE

Element occurrence code: PDSCR1L3N0.012

Global rank: G3      Forest Service status: SENSITIVE LIST  
State rank: S2

Survey site name: RED BUTTE  
County: Beaverhead

USGS quadrangle: ERMONT

Township-range: 006S011W    Section: 15  
Township-range comments: NE4,10S2

Survey date: 1986-06-19	Elevation: 6800
First observation: 1986	Slope/aspect:
Last observation: 1989-07-27	Size (acres): 20

Location:

CA. 4.5 AIR MI. NW. OF ARGENTA, CENTERED 0.5 AIR MI. ESE. OF  
RED BUTTE, RATTLESNAKE CREEK DRAINAGE CA. 1 MI. SE. OF KELLY  
RESERVOIR, PIONEER MOUNTAINS.

Element occurrence data:

142 PLANTS COUNTED IN MAIN SUBPOPULATION (CENTRUM), 169  
TOTAL, 3 SUBPOPULATIONS (1986); NO PLANTS OBSERVED IN MAIN  
SUBPOPULATION IN 1988 (K. SCOW), AND ONLY CA. 12 IN 1989  
(SHELLY); MAIN POPULATION NEAR, BUT NOT RIGHT ALONG, A  
LIGHTLY-USED GRAVEL ROAD.

General site description:

S. AND SW.-FACING SLOPES, LOAMY SOILS; ARTEMISIA TRIDENTATA/  
FESTUCA IDAHOENSIS/AGROPYRON SPICATUM, WITH SENECEO CANUS,  
PHACELIA LINEARIS, KOELERIA MACRANTHA, PSEUDOTSUGA MENZIESII.

Land owner/manager:

BEAVERHEAD NATIONAL FOREST, DILLON RANGER DISTRICT

Comments:

VOUCHER-SHELLY, J.S. (1133) AND G.V. KING, 1986, MONTU.

Information source:

SHELLY, J.S. 1986. FIELD SURVEYS IN BEAVERHEAD COUNTY OF  
18-22 JUNE.



PENSTEMON LEMHIENSIS  
LEMHI BEARDTONGUE

Element occurrence code: PDSCR1L3N0.014

Global rank: G3      Forest Service status: SENSITIVE LIST  
State rank: S2

Survey site name: ERMONT GULCH  
County: Beaverhead

USGS quadrangle: ERMONT

Township-range: 006S011W Section: 33  
Township-range comments: NE4SE4,34W2

Survey date: 1986-06-20	Elevation: 6740
First observation: 1986	Slope/aspect:
Last observation: 1989-07-27	Size (acres): 5

Location:

CA 4.3 AIR MI. WSW. OF ARGENTA, ALONG BEAVERHEAD N.F. RD.  
#7467 AT HEAD OF ERMONT GULCH, CA. 2.2 AIR MI. N. OF BADGER  
PASS, PIONEER MOUNTAINS.

Element occurrence data:

76 PLANTS COUNTED (1986); ONLY ONE PLANT SEEN IN 1989; AREA  
SUBJECT TO MODERATE TO HEAVY GRAZING.

General site description:

SE.-FACING SLOPE, LOAM SOILS; ARTEMISIA TRIDENTATA/FESTUCA  
IDAHOENSIS, ANTENNARIA MICROPHYLLA, KOELERIA MACRANTHA,  
COMANDRA UMBELLATA, ERIOGONUM.

Land owner/manager:

BEAVERHEAD NATIONAL FOREST, DILLON RANGER DISTRICT  
BLM: DILLON RESOURCE AREA, BUTTE DISTRICT

Comments:

VOUCHER-SHELLY, J.S. (1146) AND G.V. KING, 1986, MONTU

Information source:

SHELLY, J.S. 1986. FIELD SURVEYS IN BEAVERHEAD COUNTY OF OF  
18-22 JUNE.



PENSTEMON LEMHIENSIS  
LEMHI BEARDTONGUE

Element occurrence code: PDSCR1L3N0.019

Global rank: G3      Forest Service status: SENSITIVE LIST  
State rank: S2

Survey site name: BADGER PASS NORTH  
County: Beaverhead

USGS quadrangle: BANNACK

Township-range: 007S011W    Section: 09  
Township-range comments: NE4NE4,10NW4,3SW4

Survey date:	1987-06-18	Elevation:	6980
First observation:	1987	Slope/aspect:	
Last observation:	1989-07-28	Size (acres):	4

Location:

SOUTHERN PIONEER MOUNTAINS, 0.7-1.2 AIR MILES NNE. OF BADGER PASS; ABOUT 15 AIR MILES WEST OF DILLON.

Element occurrence data:

ABOUT 200 PLANTS COUNTED, POPULATION = EST. 300+ PLANTS, 3 SUBPOPULATIONS OBSERVED; FLOWERING; NUMEROUS PLANTS GROWING THROUGH BRANCHES OF SAGEBRUSH SHRUBS; AREA IS LIGHTLY TO MODERATELY GRAZED; PERMANENT MONITORING TRANSECT ESTABLISHED IN 1989.

General site description:

BROWN LOAM SOILS; ARTEMISIA TRIDENTATA/FESTUCA IDAHOENSIS, WITH PSEUDOTSUGA MENZIESII, BALSAMORHIZA SAGITTATA, LUPINUS SERICEUS, ANTENNARIA MICROPHYLLA, ASTER STENOMERES.

Land owner/manager:

BEAVERHEAD NATIONAL FOREST, DILLON RANGER DISTRICT

Comments:

VOUCHER-SHELLY, J.S. (1343), 1987, MONTU.

Information source:

SHELLY, J.S. 1987. FIELD SURVEYS IN BEAVERHEAD COUNTY OF 16-19 JUNE.





PENSTEMON LEMHIENSIS  
LEMHI BEARDTONGUE

Element occurrence code: PDSCR1L3N0.020

Global rank: G3      Forest Service status: SENSITIVE LIST  
State rank: S2

Survey site name: SELWAY CREEK  
County: Beaverhead

USGS quadrangle: KITTY CREEK

Township-range: 008S015W    Section: 27  
Township-range comments: SW4NE4

Survey date:	1987-06-19	Elevation:	7200
First observation:	1987	Slope/aspect:	
Last observation:	1989-06-29	Size (acres):	1

Location:

BLOODY DICK CREEK DRAINAGE, SLOPES ABOVE SELWAY CREEK, ABOUT  
2 MILES SOUTHEAST OF RESERVOIR LAKE; ABOUT 4 MILES EAST OF  
MONTANA-IDAHO STATE LINE.

Element occurrence data:

SIX PLANTS OBSERVED, IN 2 CLUMPS (1987); 10 PLANTS COUNTED IN  
1989; PLANTS ASSOCIATED WITH STEEP ROCK OUTCROP AREAS, AND  
NOT OBSERVED IN DENSER SURROUNDING VEGETATION.

General site description:

ROCK OUTCROPS; ARTEMISIA TRIDENTATA/FESTUCA IDAHOENSIS, WITH  
ERIOGONUM UMBELLATUM, PHACELIA FRANKLINII, SEDUM  
LANCEOLATUM, LUPINUS SERICEUS, PSEUDOTSUGA MENZIESII, PINUS  
CONTORTA.

Land owner/manager:

BEAVERHEAD NATIONAL FOREST, DILLON RANGER DISTRICT

Comments:

VOUCHER-SHELLY, J.S. (1344), 1987, MONTU.

Information source:

SHELLY, J.S. 1987. FIELD SURVEYS IN BEAVERHEAD COUNTY OF  
16-19 JUNE; SCHASSBERGER, L.A. 1989. FIELD SURVEY OF  
SOUTHWEST MONTANA, 26-30 JUNE.



PENSTEMON LEMHIENSIS  
LEMHI BEARDTONGUE

Element occurrence code: PDSCR1L3N0.004

Global rank: G3 Forest Service status: SENSITIVE LIST  
State rank: S2

Survey site name: NORTH FORK RYE CREEK  
County: Ravalli  
USGS quadrangle: ROBBINS GULCH

Township-range: 003N020W Section: 25  
Township-range comments: NW4SW4,SW4NW4

Survey date:	1989-06-26	Elevation:	4320
First observation:	1952	Slope/aspect:	35% / WEST
Last observation:	1989-06-26	Size (acres):	3

Location:

WESTERN FOOTHILLS OF THE SAPPHIRE MOUNTAINS, NORTH FORK RYE CREEK DRAINAGE, EAST SIDE OF BITTERROOT N.F. RD. #321, 0.2 AND 0.35 MILES NORTH OF RYE CREEK RD. (#75), CA. 7.5 AIR MILES ESE OF DARBY.

Element occurrence data:

TWO SUBPOPULATIONS; 72 PLANTS (SOUTH), WITH 65 ON SLOPE ABOVE ROADCUT; 11 PLANTS (NORTH), ALL ON ROADCUT; HABITAT HEAVILY INFESTED WITH WEEDS; LARGEST POPULATION KNOWN IN RAVALLI COUNTY.

General site description:

SANDY TO GRAVELLY GRANITIC SOILS, ON STEEP WEST-FACING SLOPES; PINUS PONDEROSA/PURSHIA TRIDENTATA HABITAT, WITH AGROPYRON SPICATUM, KOELERIA CRISTATA, PENSTEMON ALBERTINUS, BALSAMORHIZA SAGITTATA, PHACELIA LINEARIS, GERANIUM VISCOSISSIMUM, CENTAUREA MACULOSA, BROMUS TECTORUM, LITHOSPERMUM RUDERALE, MELILOTUS OFFICINALIS.

Land owner/manager:

PRIVATELY OWNED LAND (INDIVIDUAL OR CORPORATE)

Comments:

VOUCHER - SHELLY, J.S. (1565) AND A. KRATZ, 1989; PROBABLE RELOCATION OF HISTORICAL RECORD: WRIGHT, J.C. (S.N.), 1952, MONT: "10 MILES E. OF DARBY, SAPPHIRE MTS. FOOTHILLS, SANDY GRANITIC SOIL, PONDEROSA PINE ZONE."

Information source:

SHELLY, J.S. 1989. FIELD SURVEYS IN RAVALLI COUNTY, 26-29 JUNE.



PENSTEMON LEMHIENSIS  
LEMHI BEARDTONGUE

Element occurrence code: PDSCR1L3N0.007

Global rank: G3      Forest Service status: SENSITIVE LIST  
State rank: S2

Survey site name: MEDICINE TREE CREEK  
County: Ravalli

USGS quadrangle: ROBBINS GULCH

Township-range: 002N020W    Section: 21  
Township-range comments: NE4SE4,SW4NE4

Survey date:	1989-06-29	Elevation:	4150
First observation:	1950	Slope/aspect:	8-35% / S,SW
Last observation:	1989-06-29	Size (acres):	2

Location:

EAST FORK BITTERROOT RIVER DRAINAGE, NORTH SIDE OF U.S. HWY.  
93, 0.1 MI. WEST OF MEDICINE TREE CREEK, AND 0.3 AIR MI.  
NORTHWEST OF HWY. BRIDGE OVER CREEK, CA. 2.5 MILES SOUTHEAST  
OF CONNER.

Element occurrence data:

10 PLANTS OBSERVED, 7 ON ROADCUT, 3 ON SLOPES ABOVE.

General site description:

GRANITIC, GRAVELLY TO SANDY LOAM SOILS, ON ROADCUT AND WEEDY  
SLOPES; PINUS PONDEROSA/PURSHIA TRIDENTATA HABITAT, WITH  
CENTAUREA MACULOSA, BROMUS TECTORUM, KOELERIA CRISTATA,  
BALSAMORHIZA SAGITTATA, PHACELIA LINEARIS, P. HETEROPHYLLA,  
PHYSARIA GEYERI, ALYSSUM ALYSSOIDES, AGROPYRON SPICATUM,  
VERBASCUM THAPSUS, ARABIS HOLBOELLII.

Land owner/manager:

PRIVATELY OWNED LAND (INDIVIDUAL OR CORPORATE)

Comments:

VOUCHER - SHELLY, J.S. (1568) AND A. KRATZ, 1989; POSSIBLE  
RELOCATION OF HISTORICAL RECORD: MCCALL, T.G. & V.C. (352),  
1950, MONTU (49394): "BETWEEN CONNER AND SULA, ON ROCKY  
HILLSIDE ABOVE RIVER."

Information source:

SHELLY, J.S. 1989. FIELD SURVEYS IN RAVALLI COUNTY, 26-29  
JUNE.



PENSTEMON LEMHIENSIS  
LEMHI BEARDTONGUE

Element occurrence code: PDSCR1L3N0.023

Global rank: G3      Forest Service status: SENSITIVE LIST  
State rank: S2

Survey site name: MINER CREEK  
County: Beaverhead

USGS quadrangle: MINER LAKE

Township-range: 006S016W    Section: 02  
Township-range comments: SE4

Survey date: 1989-06-30	Elevation: 7080
First observation: 1989	Slope/aspect: 3-15% / ESE
Last observation: 1989-06-30	Size (acres): 10

Location:

BIGHOLE VALLEY, CA. 6 MILES SOUTHWEST OF JACKSON, NORTH OF  
F.S. ROAD 182.

Element occurrence data:

UNCOMMON, 17 PLANTS IN 1989.

General site description:

SAGEBRUSH GRASSLAND WITH SPERGULA ARVENSIS, ERIOGONUM  
UMBELLATUM, CAREX FILIFOLIA, LUPINUS SERICEUS.

Land owner/manager:

BEAVERHEAD NATIONAL FOREST, WISDOM RANGER DISTRICT

Comments:

VOUCHER - SCHASSBERGER, L.S. (311), 1989, (MONTU).

Information source:

SCHASSBERGER, L.S. 1989. FIELD SURVEYS IN SOUTHWEST MONTANA  
OF 26-30 JUNE.





PENSTEMON LEMHIENSIS  
LEMHI BEARDTONGUE

Element occurrence code: PDSCR1L3N0.024

Global rank: G3      Forest Service status: SENSITIVE LIST  
State rank: S2

Survey site name: FROG CREEK  
County: Beaverhead

USGS quadrangle: COYOTE CREEK

Township-range: 009S014W    Section: 21  
Township-range comments: SW4

Survey date: 1989-06-29	Elevation: 7280
First observation: 1989	Slope/aspect: 8-15% / EAST
Last observation: 1989-06-29	Size (acres): 1

Location:  
HORSE PRAIRIE, CA. 1 MILE NORTHWEST OF HORSE PRAIRIE GUARD  
STATION.

Element occurrence data:  
26 PLANTS IN 1989.

General site description:  
ON ROADSIDE EMBANKMENT WITH BALSAMORHIZA SAGITTATA,  
ARTEMISIA TRIDENTATA, CASTILLEJA PALLESCENS, FESTUCA  
IDAHOENSIS AND FRAGARIA VESCA.

Land owner/manager:  
PRIVATELY OWNED LAND (INDIVIDUAL OR CORPORATE)  
BLM: DILLON RESOURCE AREA, BUTTE DISTRICT

Comments:  
POPULATION COULD BE ELIMINATED THROUGH ROAD MAINTENANCE.

Information source:  
SCHASSBERGER, L.A. 1989. FIELD SURVEYS OF SOUTHWEST MONTANA,  
26-30 JUNE (PENSTEMON LEMHIENSIS).



PENSTEMON LEMHIENSIS  
LEMHI BEARDTONGUE

Element occurrence code: PDSCR1L3N0.025

Global rank: G3      Forest Service status: SENSITIVE LIST  
State rank: S2

Survey site name: BRISTON LANE  
County: Beaverhead

USGS quadrangle: HIGHLAND RANCH

Township-range: 003S016W    Section: 35  
Township-range comments: NE4,S2

Survey date: 1989-06-30	Elevation: 6260
First observation: 1989	Slope/aspect: 8-15% / EAST
Last observation: 1989-06-30	Size (acres): 10

Location:

CA. 5.5 MILES SSW OF WISDOM. CA. 3.5 MILES ALONG BRISTON  
LANE, JUST WEST OF THE ROAD.

Element occurrence data:  
110 PLANTS IN 1989.

General site description:

SITE WAS BURNED (SAGEBRUSH GONE) AND IS GRAZED. ASSOCIATED  
SPECIES INCLUDE AGROPYRON SPICATUM, STIPA COMATA, ERIOGONUM  
UMBELLATUM VAR SUBALPINUM, SEDUM LANCEOLATUM, GERANIUM  
VISCOSISSIMUM AND SPERGULA ARVENSIS.

Land owner/manager:

PRIVATELY OWNED LAND (INDIVIDUAL OR CORPORATE)

Comments:

BURNING AND GRAZING APPEARS TO HAVE IMPROVED THE HABITAT FOR  
P. LEMHIENSIS.

Information source:

SCHASSBERGER, L.A. 1989. FIELD SURVEYS OF SOUTHWEST MONTANA,  
26-30 JUNE.



PENSTEMON LEMHIENSIS  
LEMHI BEARDTONGUE

Element occurrence code: PDSCR1L3N0.026

Global rank: G3      Forest Service status: SENSITIVE LIST  
State rank: S2

Survey site name: SWAMP CREEK  
County: Beaverhead

USGS quadrangle: HIGHLAND RANCH

Township-range: 003S016W    Section: 04  
Township-range comments: E2

Survey date:	1989-06-30	Elevation:	6260
First observation:	1989	Slope/aspect:	0-3% / SE
Last observation:	1989-06-30	Size (acres):	3

Location:

BIGHOLE VALLEY, CA. 5.2 MILES WEST OF WISDOM, ALONG SWAMP  
CREEK RD., SOUTH OF ROAD.

Element occurrence data:

23 PLANTS IN 1989.

General site description:

IN OPEN ROCKY GROUND, WITH ARTEMISIA TRIDENTATA, SEDUM  
LANCEOLATUM, ASTRAGALUS MISER, TARAXACUM OFFICINALE, STIPA  
COMATA AND POA SECUNDA.

Land owner/manager:

PRIVATELY OWNED LAND (INDIVIDUAL OR CORPORATE)

Comments:

CATTLE DISTURBANCE AROUND SALT LICK APPEARS TO HAVE ENHANCED  
HABITAT FOR THIS SPECIES.

Information source:

SCHASSBERGER, L.A. 1989. FIELD SURVEYS IN SOUTHWESTERN  
MONTANA OF 26-30 JUNE.



PENSTEMON LEMHIENSIS  
LEMHI BEARDTONGUE

Element occurrence code: PDSCR1L3N0.027

Global rank: G3      Forest Service status: SENSITIVE LIST  
State rank: S2

Survey site name: HORSE PRAIRIE GUARD STATION  
County: Beaverhead

USGS quadrangle: COYOTE CREEK

Township-range: 009S014W    Section: 27  
Township-range comments: NW4SW4

Survey date: 1989-06-29	Elevation: 6690
First observation: 1989	Slope/aspect: 3-8% / SOUTH
Last observation: 1989-06-29	Size (acres): 1

Location:

HORSE PRAIRIE, CA. 0.5 MILES SE OF HORSE PRAIRIE GUARD  
STATION.

Element occurrence data:

VERY SMALL POPULATION, ONLY 3 PLANTS IN A ROADCUT.

General site description:

ON ROADSIDE, WITH ARTEMISIA TRIDENTATA, BALSAMORHIZA  
SAGITTATA, CASTILLEJA PALLESCENS, FESTUCA IDAHOENSIS, AND  
FRAGARIA VESCA.

Land owner/manager:

BLM: DILLON RESOURCE AREA, BUTTE DISTRICT

Comments:

NONE.

Information source:

SCHASSBERGER, L.A. 1989. FIELD SURVEY OF SOUTHWEST MONTANA,  
26-30 JUNE.





PENSTEMON LEMHIENSIS  
LEMHI BEARDTONGUE

Element occurrence code: PDSCR1L3N0.028

Global rank: G3      Forest Service status: SENSITIVE LIST  
State rank: S2

Survey site name: BLOODY DICK CREEK I  
County: Beaverhead

USGS quadrangle: COYOTE CREEK

Township-range: 009S014W    Section: 31  
Township-range comments: W2,SE4;T10SR14W:5NW4

Survey date:	1989-06-29	Elevation:	6600
First observation:	1989	Slope/aspect:	0-3% / SW
Last observation:	1989-06-29	Size (acres):	2

Location:

HORSE PRAIRIE, ALONG BLOODY DICK CREEK, CA. 7.1 MILES WEST  
OF RED BUTTE.

Element occurrence data:

34 PLANTS, FOUR SMALL SUBPOPULATIONS (1989).

General site description:

PLANTS ALONG ROADSIDE, WITH ARTEMISIA TRIPARTITA, FESTUCA  
IDAHOENSIS, AGROPYRON SPICATUM AND CASTILLEJA PALLESCENS.

Land owner/manager:

PRIVATELY OWNED LAND (INDIVIDUAL OR CORPORATE)  
BLM: DILLON RESOURCE AREA, BUTTE DISTRICT

Comments:

AREAS WHICH HAD FEW OR NO PLANTS IN 1988, HAD AS MANY AS  
10-15 PLANTS IN 1989.

Information source:

SCHASSBERGER, L.A. 1989. FIELD SURVEY OF SOUTHWEST MONTANA,  
26-30 JUNE.



PENSTEMON LEMHIENSIS  
LEMHI BEARDTONGUE

Element occurrence code: PDSCR1L3N0.029

Global rank: G3      Forest Service status: SENSITIVE LIST  
State rank: S2

Survey site name: BLOODY DICK CREEK 2  
County: Beaverhead

USGS quadrangle: EVERSON CREEK

Township-range: 010S014W    Section: 05  
Township-range comments: NW4;4N2

Survey date:	1989-06-29	Elevation:	4440
First observation:	1989	Slope/aspect:	0-8% / SW
Last observation:	1989-06-29	Size (acres):	2

Location:  
HORSE PRAIRIE, CA. 5.1 MILES WEST OF RED BUTTE, ALONG BLOODY  
DICK CREEK ROAD.

Element occurrence data:  
22 PLANTS, FOUR SMALL SUBPOPULATIONS (1989).

General site description:  
WITH ARTEMISIA TRIDENTATA, CASTILLEJA PALLESCENS,  
ORTHOCARPUS LUTEUS AND AGROPYRON SPICATUM.

Land owner/manager:  
PRIVATELY OWNED LAND (INDIVIDUAL OR CORPORATE)  
BLM: DILLON RESOURCE AREA, BUTTE DISTRICT

Comments:  
NONE.

Information source:  
SCHASSBERGER, L.A. 1989. FIELD SURVEYS OF SOUTHWEST MONTANA,  
26-30 JUNE.



PENSTEMON LEMHIENSIS  
LEMHI BEARDTONGUE

Element occurrence code: PDSCR1L3N0.030

Global rank: G3 Forest Service status: SENSITIVE LIST  
State rank: S2

Survey site name: SPRING GULCH  
County: Ravalli

USGS quadrangle: ROBBINS GULCH

Township-range: 003N020W Section: 24  
Township-range comments: SE4SE4

Survey date: 1989-06-27	Elevation: 5200
First observation: 1989	Slope/aspect: 35%+ / SE
Last observation: 1989-06-27	Size (acres): 1

Location:

WESTERN FOOTHILLS OF SAPPHIRE MOUNTAINS, RYE CREEK DRAINAGE,  
SPRING GULCH, 1.15 AIR MILES NORTHEAST OF CONFLUENCE OF RYE  
CREEK AND NORTH FORK RYE CREEK, CA. 8 AIR MILES ESE OF  
DARBY.

Element occurrence data:

FOUR PLANTS OBSERVED; ONE FLOWERING, 3 STERILE ROSETTES;  
HABITAT SERIOUSLY IMPACTED BY KNAPWEED INVASION.

General site description:

GRANITIC GRAVELLY LOAM SOILS; PURSHIA TRIDENTATA/AGROPYRON  
SPICATUM HABITAT, WITH CENTAUREA MACULOSA, BALSAMORHIZA  
SAGITTATA, BROMUS TECTORUM, KOELERIA CRISTATA, POA SECUNDA,  
ACHILLEA MILLEFOLIUM, DESCURAINIA RICHARDSONII, PHACELIA  
LINEARIS, LOMATIUM DISSECTUM, TRAGOPOGON DUBIUS.

Land owner/manager:

BITTERROOT NATIONAL FOREST, DARBY RANGER DISTRICT

Comments:

SIGHT RECORD, NO VOUCHER SPECIMEN COLLECTED; SITE SURVEYED  
WITH A. KRATZ, BITTERROOT / LOLO N.F.S.

Information source:

SHELLY, J.S. 1989. FIELD SURVEYS IN RAVALLI COUNTY, 26-29  
JUNE.



PENSTEMON LEMHIENSIS  
LEMHI BEARDTONGUE

Element occurrence code: PDSCR1L3N0.031

Global rank: G3      Forest Service status: SENSITIVE LIST  
State rank: S2

Survey site name: ROBBINS GULCH  
County: Ravalli

USGS quadrangle: ROBBINS GULCH

Township-range: 002N020W    Section: 16  
Township-range comments: N2NW4,9SE4SW4

Survey date: 1989-06-29	Elevation: 4500
First observation: 1989	Slope/aspect: 8-35% / SE
Last observation: 1989-06-29	Size (acres): 5

Location:

WESTERN FOOTHILLS OF SAPPHIRE MOUNTAINS, EAST FORK  
BITTERROOT RIVER DRAINAGE, ROBBINS GULCH, NORTH OF  
BITTERROOT N.F. RD. #446, CA. 1 MILE NORTHEAST OF U.S. HWY.  
93.

Element occurrence data:

14 PLANTS OBSERVED, IN 5 SMALL COLONIES; 8 FLOWERING, 6  
ROSETTES, ONE PLANT ON ROADSIDE.

General site description:

GRANITIC, SANDY TO GRAVELLY LOAM SOILS; PINUS  
PONDEROSA/PURSHIA TRIDENTATA HABITAT, WITH KOELERIA  
CRISTATA, CENTAUREA MACULOSA, AGROPYRON SPICATUM,  
BALSAMORHIZA SAGITTATA, PHACELIA LINEARIS, POA SECUNDA,  
ALYSSUM ALYSSOIDES, LITHOSPERMUM RUDERALE, PENSTEMON  
ALBERTINUS.

Land owner/manager:

PRIVATELY OWNED LAND (INDIVIDUAL OR CORPORATE)  
BITTERROOT NATIONAL FOREST, DARBY RANGER DISTRICT

Comments:

VOUCHER - SHELLY, J.S. (1569) AND A. KRATZ, 1989.

Information source:

SHELLY, J.S. 1989. FIELD SURVEYS IN RAVALLI COUNTY, 26-29  
JUNE.





PENSTEMON LEMHIENSIS  
LEMHI BEARDTONGUE

Element occurrence code: PDSCR1L3N0.032

Global rank: G3      Forest Service status: SENSITIVE LIST  
State rank: S2

Survey site name: POLARIS  
County: Beaverhead

USGS quadrangle: POLARIS - 15'

Township-range: 005S012W    Section: 30  
Township-range comments: NE4NE4,19SE4SE4

Survey date:	Elevation: 6400
First observation: 1989	Slope/aspect: 35 % / EAST
Last observation: 1989-06-28	Size (acres): 0

Location:

GRASSHOPPER CREEK RD., CA. 0.5 MILES NORTH OF POLARIS, CA.  
0.1 MILE NORTH OF GRASSHOPPER CREEK CROSSING, IMMEDIATELY  
NORTH OF GRAVEL PIT.

Element occurrence data:

POPULATION OF 50+ PLANTS IN 1989.

General site description:

GROWING ON EAST-FACING ROADCUT IN ALLUVIUM WITH 50 PERCENT  
COARSE FRAGMENTS, WITH ARTEMISIA TRIDENTATA, CHRYSOTHAMNUS  
NAUSEOSUS, AGROPYRON SPICATUM, AND BROMUS TECTORUM.

Land owner/manager:

PRIVATELY OWNED LAND (INDIVIDUAL OR CORPORATE)

Comments:

PLANTENBERG - "THE SITE WILL EVENTUALLY BE LOST TO KNAPWEED  
CONTROL - ACTIVE ROADCUT."

Information source:

PLANTENBERG, PATRICK L. DEPT. OF STATE LANDS, HARD ROCK  
BUREAU, RECLAMATION DIVISION, 1625 11TH AVE., HELENA, MT  
59620.



PENSTEMON LEMHIENSIS  
LEMHI BEARDTONGUE

Element occurrence code: PDSCR1L3N0.033

Global rank: G3      Forest Service status: SENSITIVE LIST  
State rank: S2

Survey site name: SHALE CREEK  
County: Beaverhead

USGS quadrangle: POLARIS - 15'

Township-range: 005S012W    Section: 08  
Township-range comments: SW4SW4

Survey date:	Elevation: 6560
First observation: 1989	Slope/aspect: 35% / EAST
Last observation: 1989-06-28	Size (acres): 0

Location:

GRASSHOPPER CREEK RD., CA. 2.5 MILES NORTH OF POLARIS, ON  
CREST OF HILL.

Element occurrence data:

POPULATION OF 2 PLANTS IN 1989.

General site description:

ON EAST FACING ROADCUT. IN DEEP LOAMY SOIL, WITH LESS THAN  
5% COARSE FRAGMENTS, WITH ARTEMISIA TRIDENTATA, GUTIERREZIA  
SAROTHRAE, AGROPYRON SPICATUM, AND BROMUS TECTORUM.

Land owner/manager:

PRIVATELY OWNED LAND (INDIVIDUAL OR CORPORATE)

Comments:

PLANTENBERG - "SITE WILL EVENTUALLY BE ELIMINATED BY  
KNAPWEED CONTROL - ACTIVE ROADCUT."

Information source:

PLANTENBERG, PATRICK L. DEPT. OF STATE LANDS, HARD ROCK  
BUREAU, RECLAMATION DIVISION, 1625 11TH AVE., HELENA, MT  
59620.



PENSTEMON LEMHIENSIS  
LEMHI BEARDTONGUE

Element occurrence code: PDSCR1L3N0.034

Global rank: G3      Forest Service status: SENSITIVE LIST  
State rank: S2

Survey site name: BLOODY DICK CREEK III  
County: Beaverhead

USGS quadrangle: KITTY CREEK

Township-range: 009S015W    Section: 25  
Township-range comments: SW4

Survey date: 1989-06-29	Elevation: 6600
First observation: 1989	Slope/aspect: 0-30% / SW
Last observation: 1989-06-29	Size (acres): 15

Location:

BLOODY DICK CREEK RD., CA. 0.75 MILE SOUTH OF EAST PETERSON  
CK.

Element occurrence data:

74 PLANTS IN 3 SUBPOPULATIONS IN 1989.

General site description:

SOUTHWEST SLOPE, WITH ARTEMISIA TRIPARTITA, FESTUCA  
IDAHOENSIS, AGROPYRON SPICATUM, AND CASTILLEJA PALLESCENS.

Land owner/manager:

PRIVATELY OWNED LAND (INDIVIDUAL OR CORPORATE)

Comments:

VOUCHER - SCHASSBERGER, L.A. (303), 1989.

Information source:

SCHASSBERGER, L.A. 1989, FIELD SURVEY OF SOUTHWEST MONTANA,  
26-30 JUNE.



PENSTEMON LEMHIENSIS  
LEMHI BEARDTONGUE

Element occurrence code: PDSCR1L3N0.035

Global rank: G3      Forest Service status: SENSITIVE LIST  
State rank: S2

Survey site name: DUTCH CREEK  
County: Beaverhead

USGS quadrangle: KITTY CREEK

Township-range: 009S015W    Section: 14  
Township-range comments: SW4,23NE4

Survey date: 1989-06-29	Elevation: 6760
First observation: 1989	Slope/aspect: 0-35% / SW
Last observation: 1989-06-29	Size (acres): 12

Location:  
BLOODY DICK CREEK RD., CA. 0.25 MILE NORTH AND 0.3 MILE  
SOUTH OF DUTCH CREEK.

Element occurrence data:  
CA. 30 PLANTS IN 2 SUBPOPULATIONS IN 1989.

General site description:  
ROADSIDE POPULATIONS IN ROCKY LOAM SOILS, WITH ARTEMISIA  
TRIDENTATA AND FESTUCA IDAHOENSIS.

Land owner/manager:  
BEAVERHEAD NATIONAL FOREST, DILLON RANGER DISTRICT  
BLM: DILLON RESOURCE AREA, BUTTE DISTRICT

Comments:  
VOUCHER - SCHASSBERGER, L.A. (302), 1989.

Information source:  
SCHASSBERGER, L.A. 1989. FIELD SURVEY OF SOUTHWEST MONTANA,  
26-30 JUNE.





PENSTEMON LEMHIENSIS  
LEMHI BEARDTONGUE

Element occurrence code: PDSCR1L3N0.036

Global rank: G3      Forest Service status: SENSITIVE LIST  
State rank: S2

Survey site name: BLANCHARD POND  
County: Beaverhead

USGS quadrangle: JACKSON

Township-range: 006S015W    Section: 33  
Township-range comments: NE4SE4

Survey date: 1989-06-30	Elevation: 6880
First observation: 1989	Slope/aspect: 3-8% / EAST
Last observation: 1989-06-30	Size (acres): 1

Location:

BIG HOLE RIVER DRAINAGE, SKINNER MEADOWS RD., CA. 6.5 MILES  
SSW OF JACKSON.

Element occurrence data:  
61 PLANTS COUNTED.

General site description:

ON (ALLUVIAL) ROAD EMBANKMENT, WITH ARTEMISIA TRIDENTATA,  
ERIOGONUM UMBELLATUM VARIETIES SUBALPINUM AND INTECTUM, AND  
ERIOPHYLLUM LANATUM.

Land owner/manager:

PRIVATELY OWNED LAND (INDIVIDUAL OR CORPORATE)

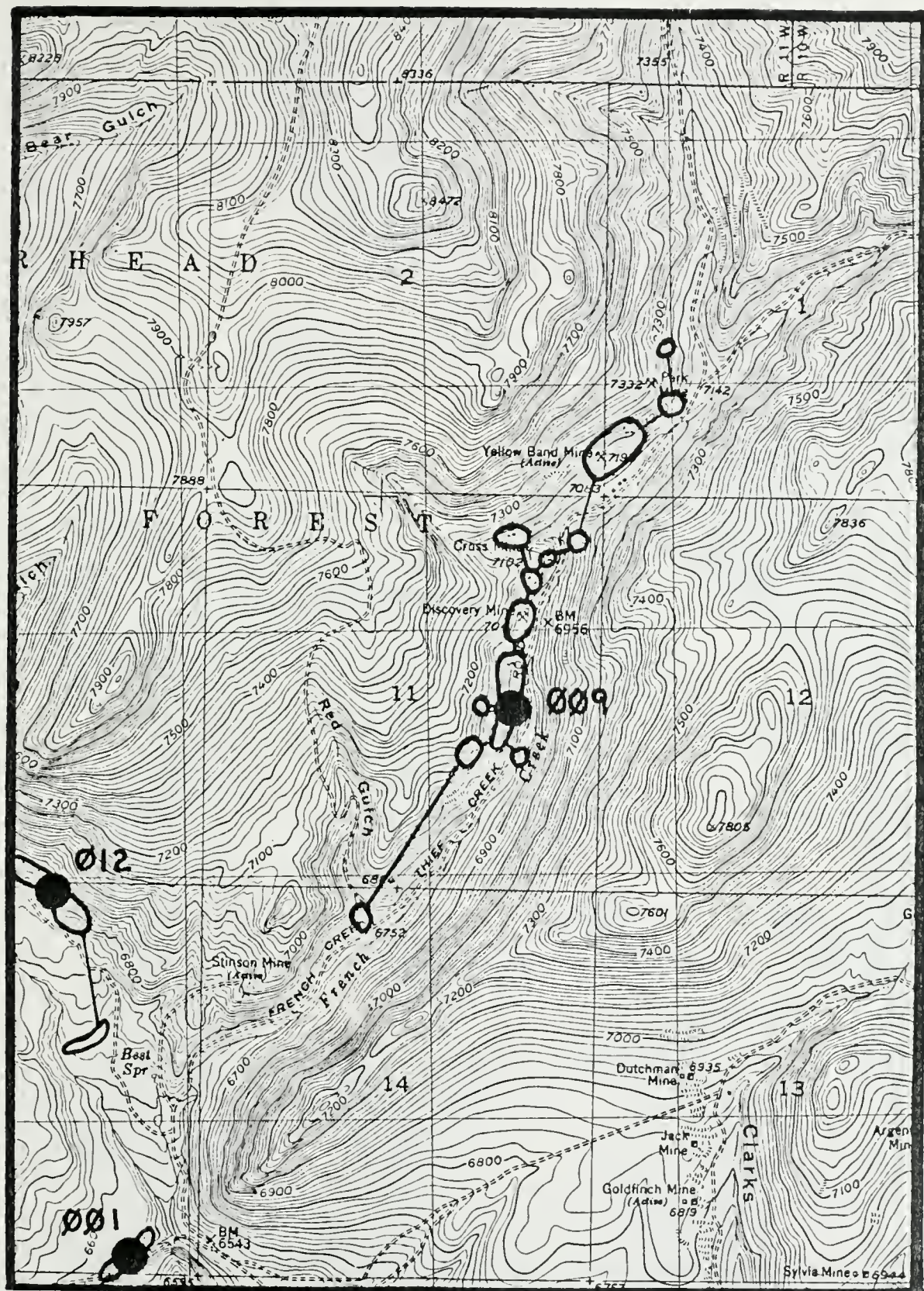
Comments:

VOUCHER - SCHASSBERGER, L.A. (309), 1989. POPULATION MAY BE  
DESTROYED THROUGH ROAD MAINTENANCE ACTIVITIES.

Information source:

SCHASSBERGER, L.A. 1989. FIELD SURVEY OF SOUTHWEST MONTANA,  
26-30 JUNE.



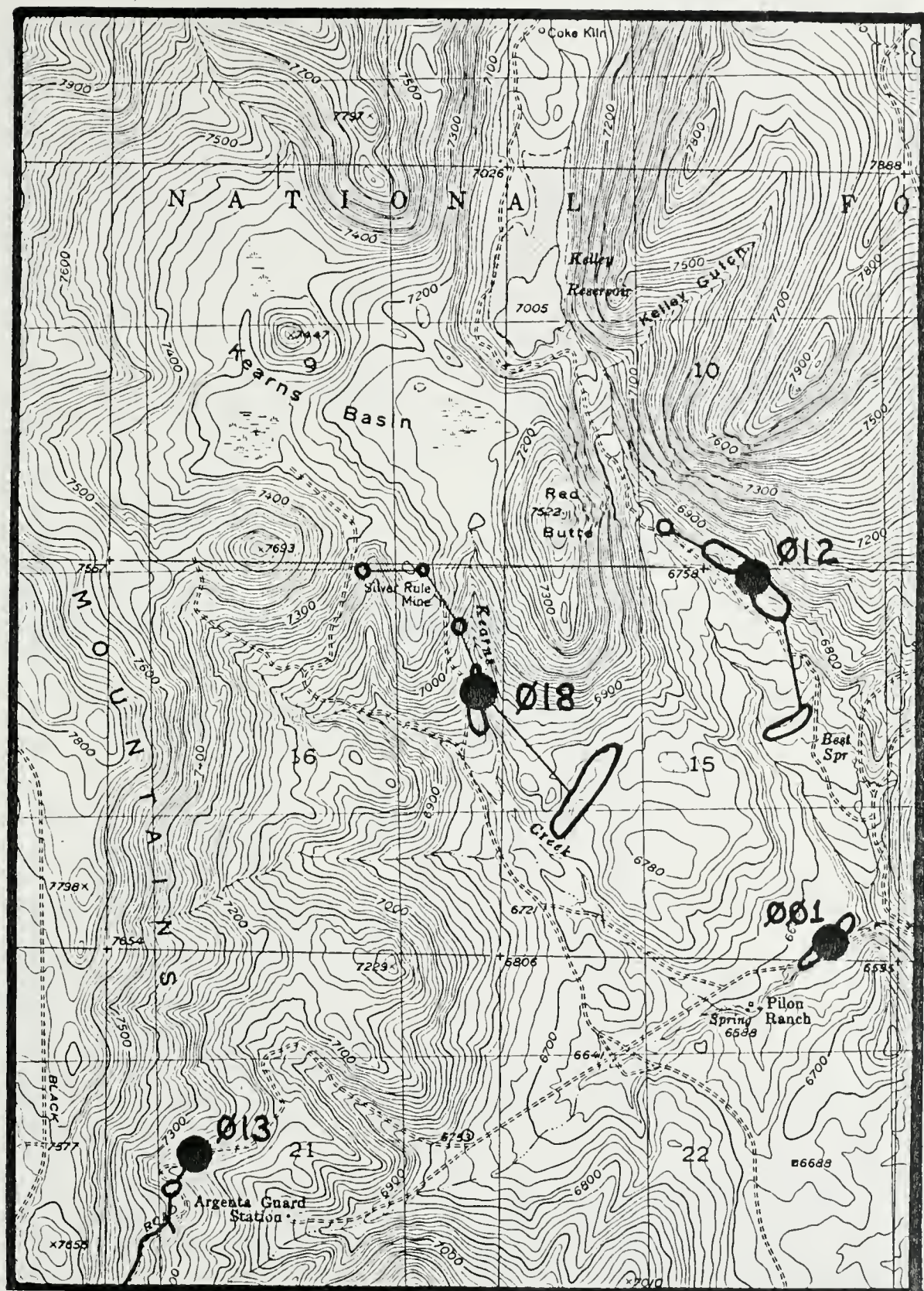


USGS Ermont Quadrangle (7.5')

Penstemon lemhiensis





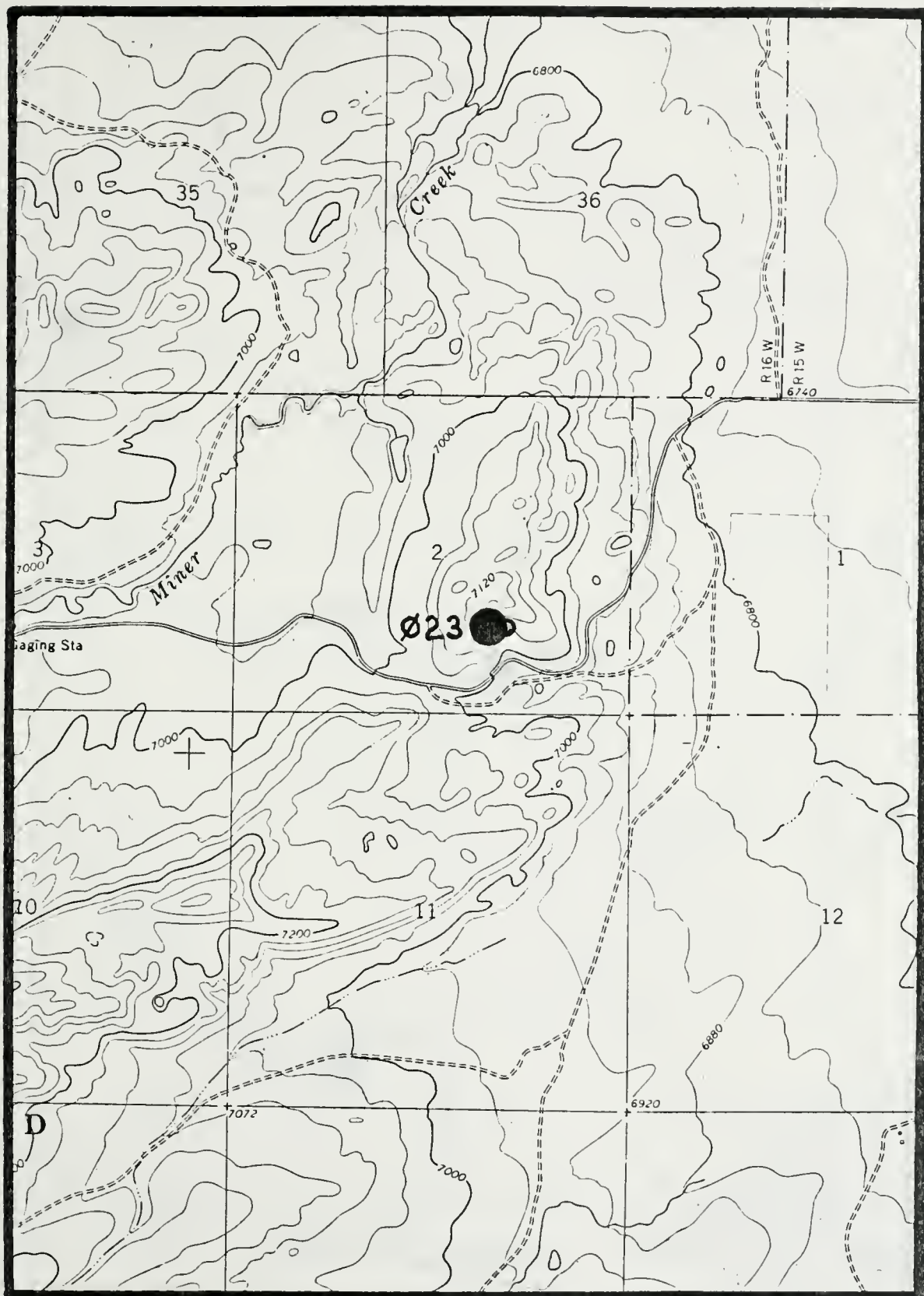


USGS Ermont Quadrangle (7.5')

Penstemon lemhiensis





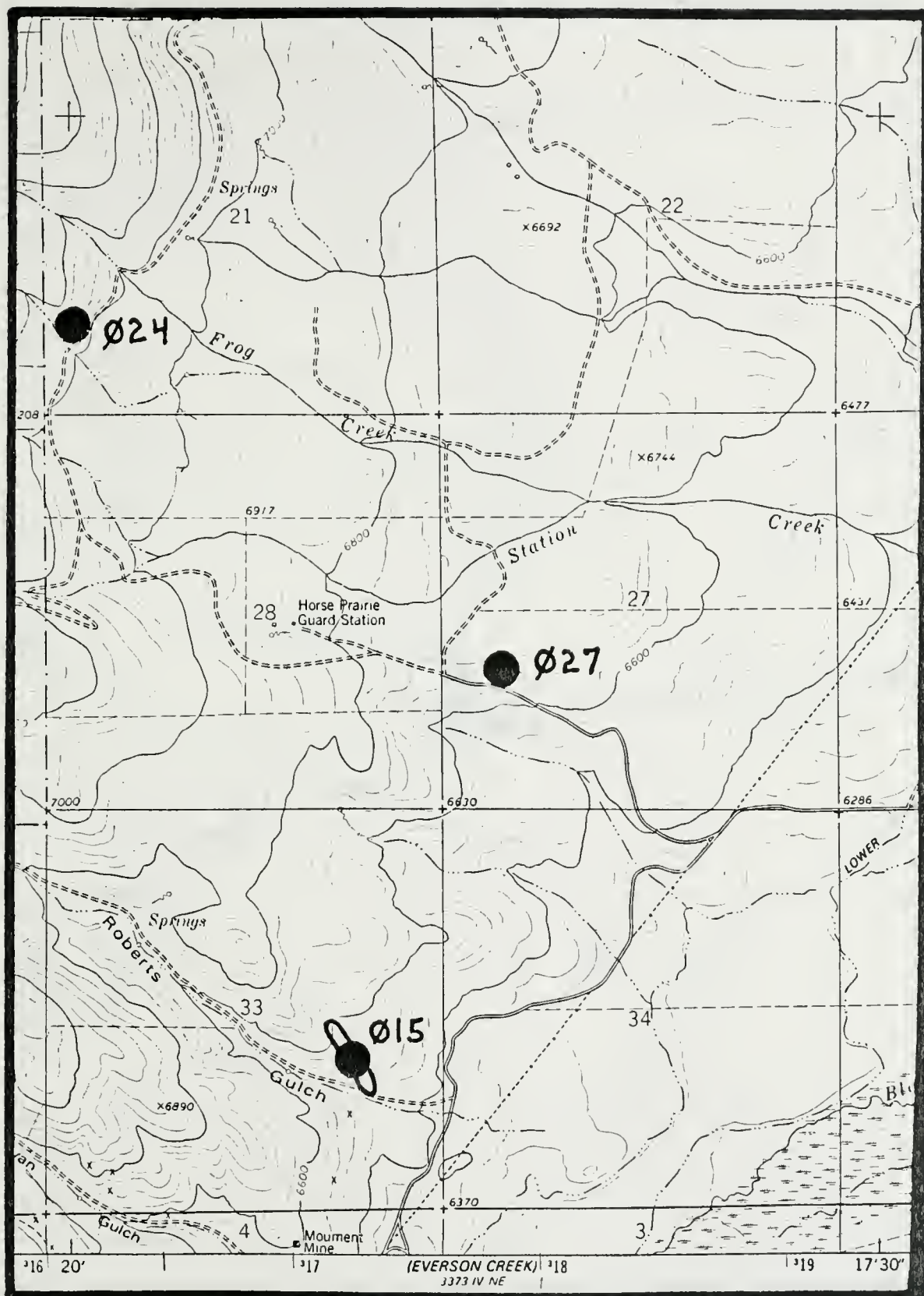


USGS Miner Lake Quadrangle (7.5')

Penstemon lemhiensis



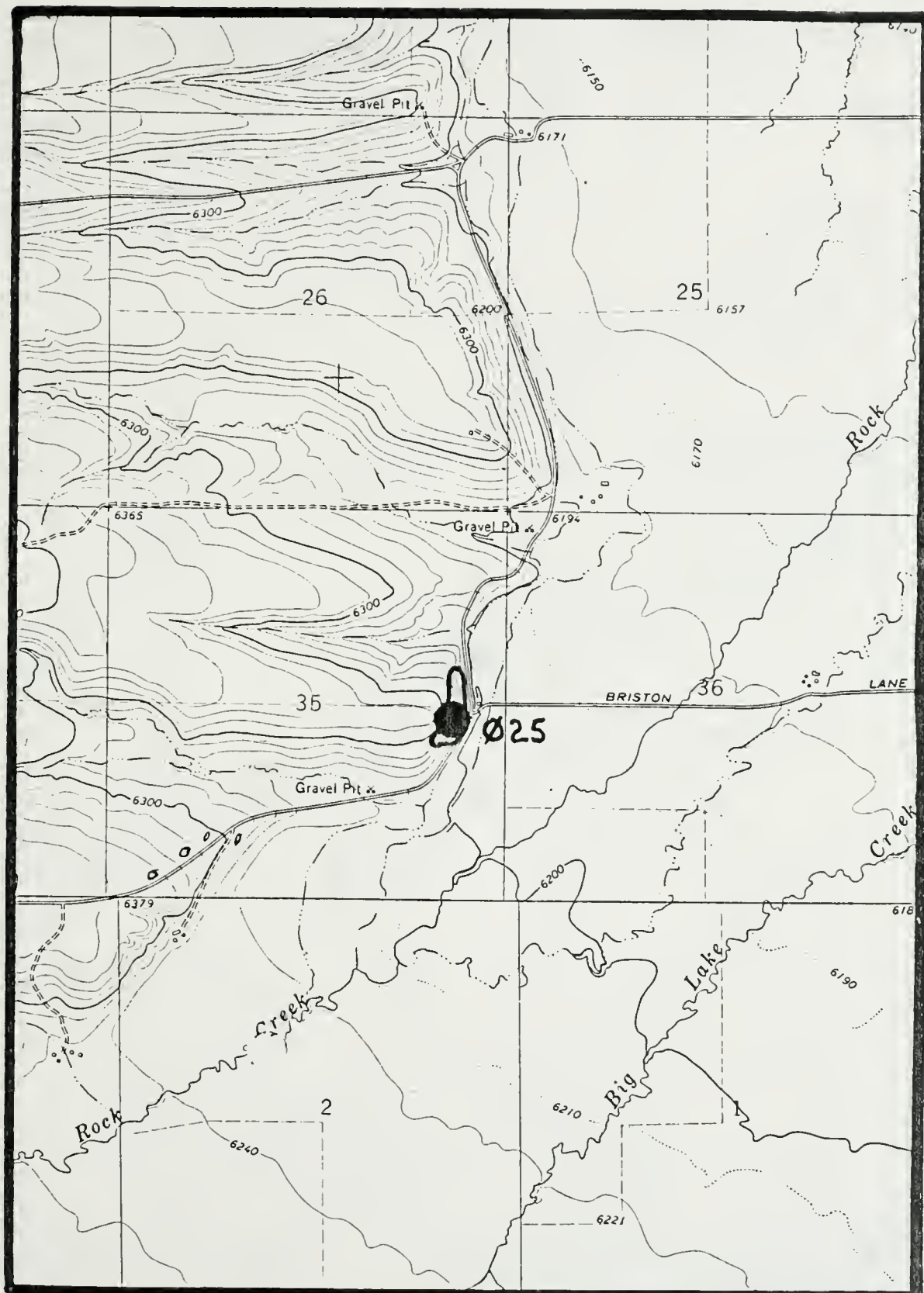




USGS Coyote Creek Quadrangle (7.5')

*Penstemon lemhiensis*

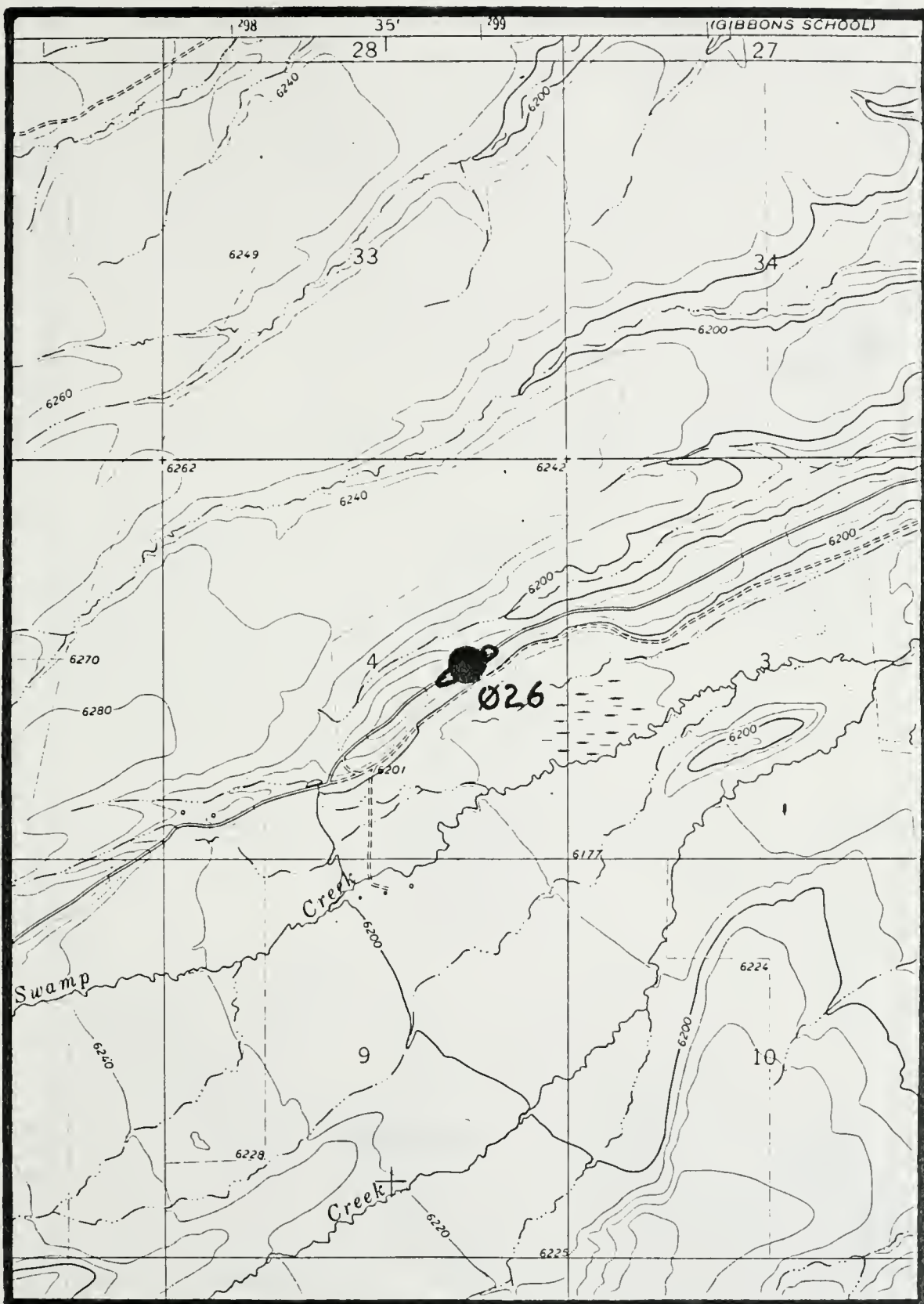




USGS Highland Ranch Quadrangle (7.5')

Penstemon lemhiensis



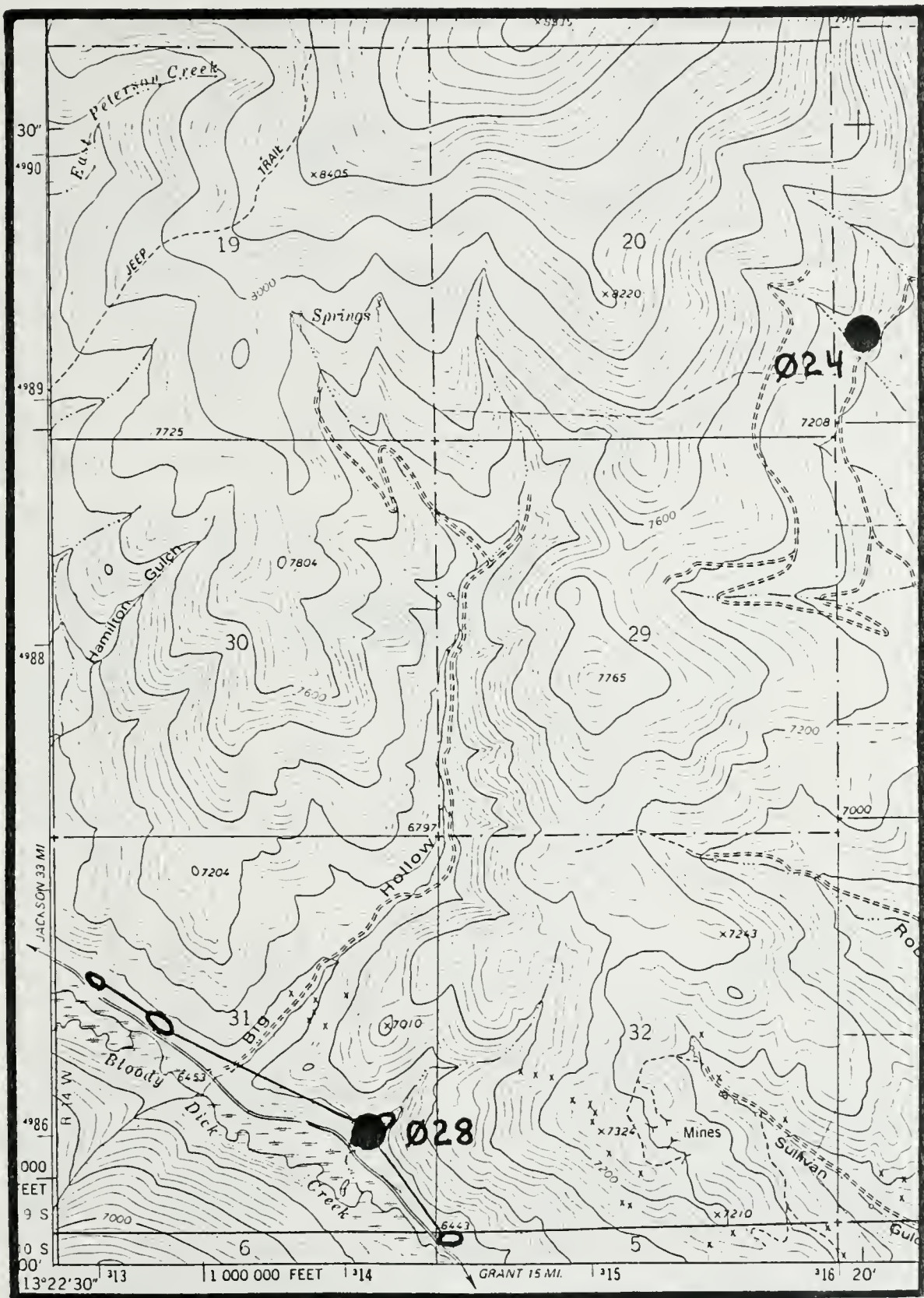


USGS Highland Ranch Quadrangle (7.5')

Penstemon lemhiensis





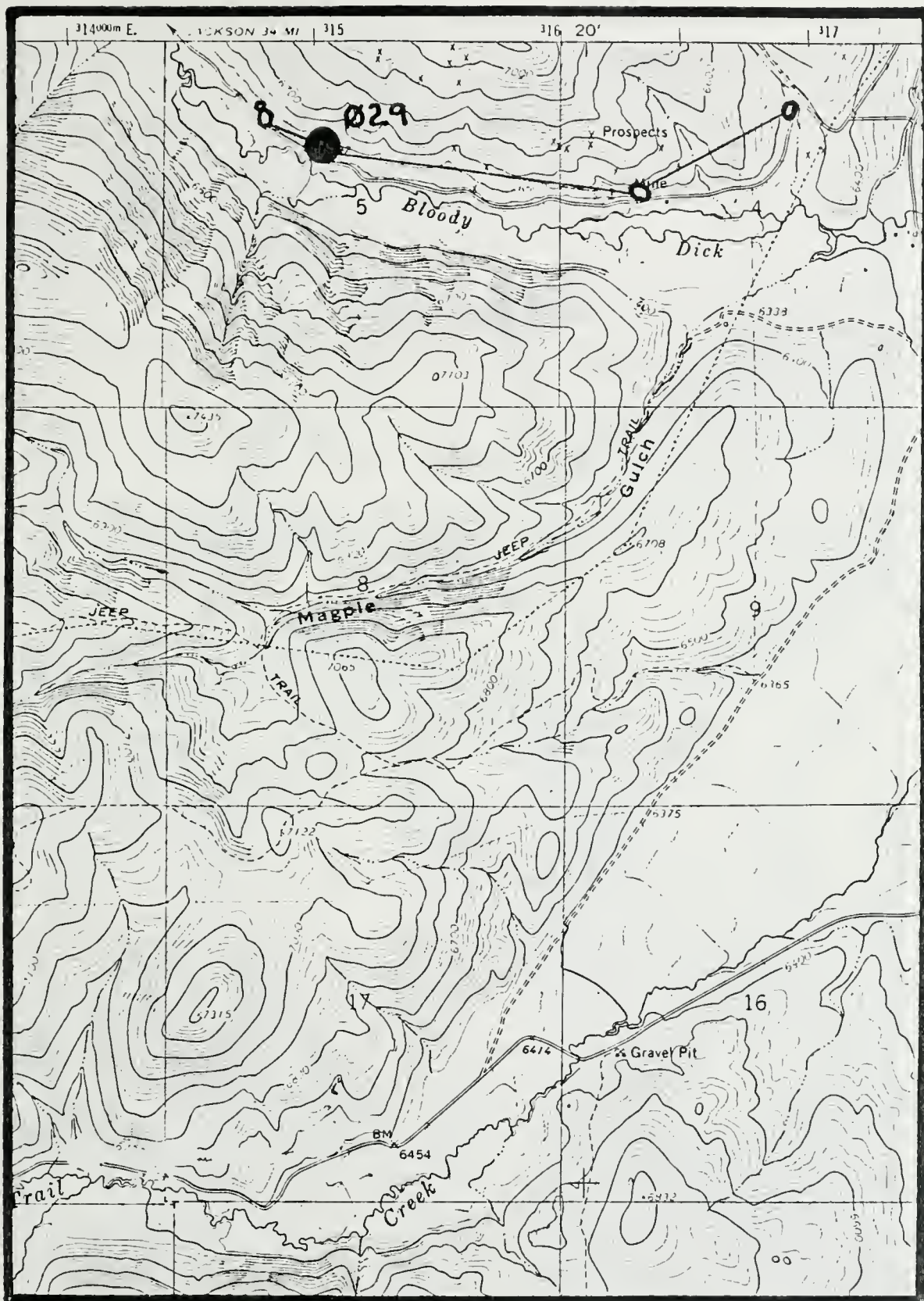


USGS Coyote Creek Quadrangle (7.5')

Penstemon lemhiensis





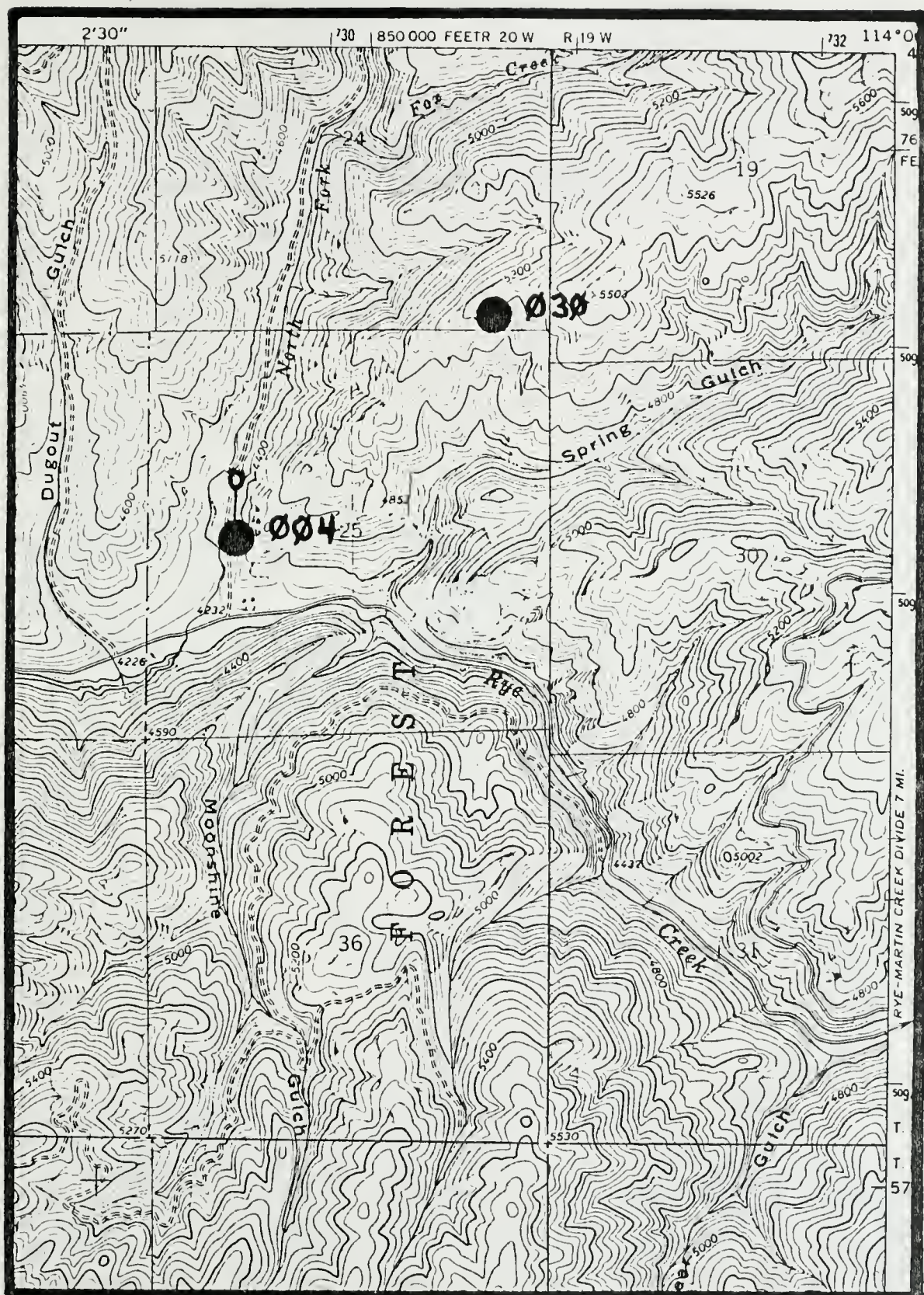


USGS Everson Creek Quadrangle (7.5')

Penstemon lemhiensis





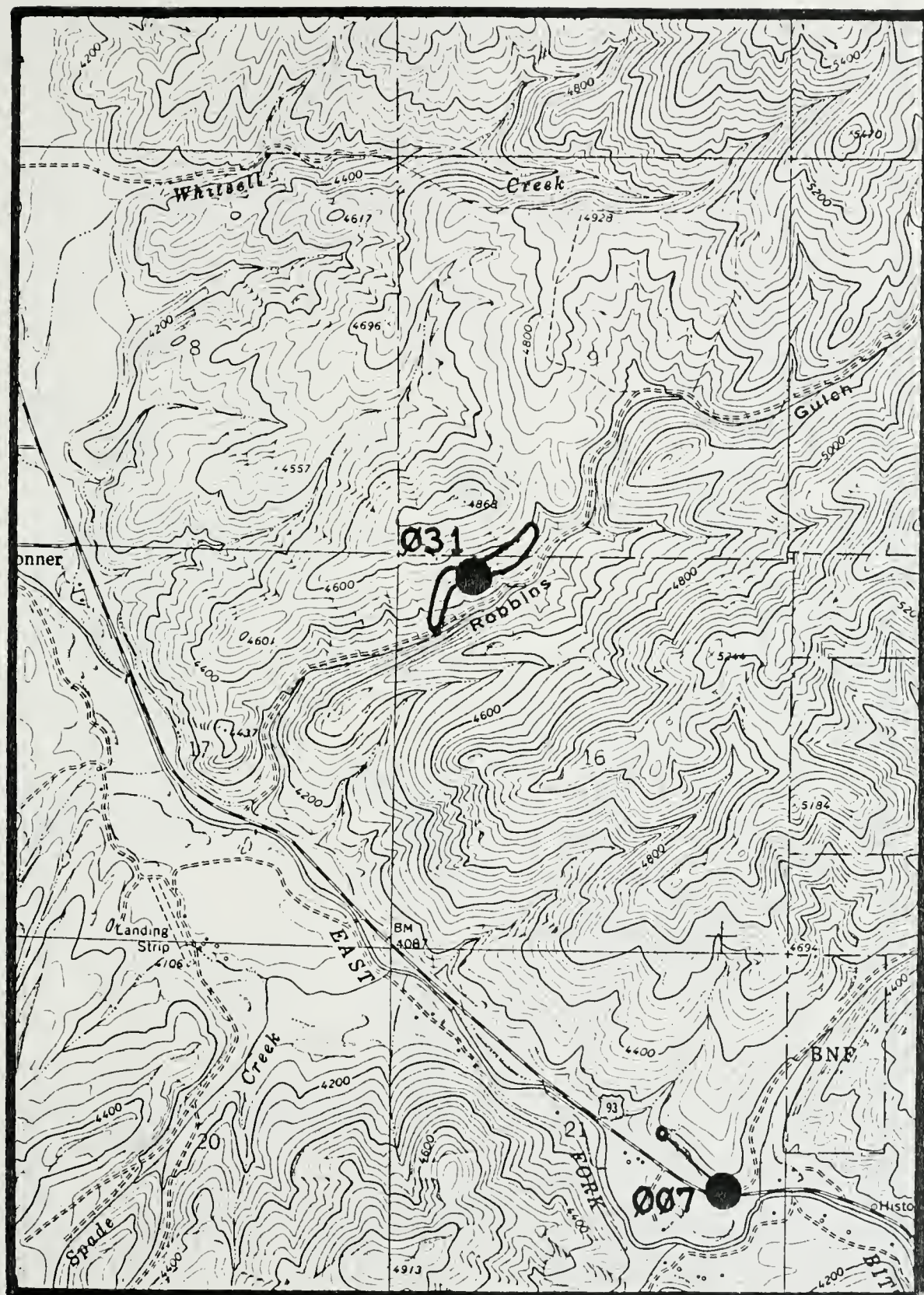


USGS Robbins Gulch Quadrangle (7.5')

Penstemon lemhiensis





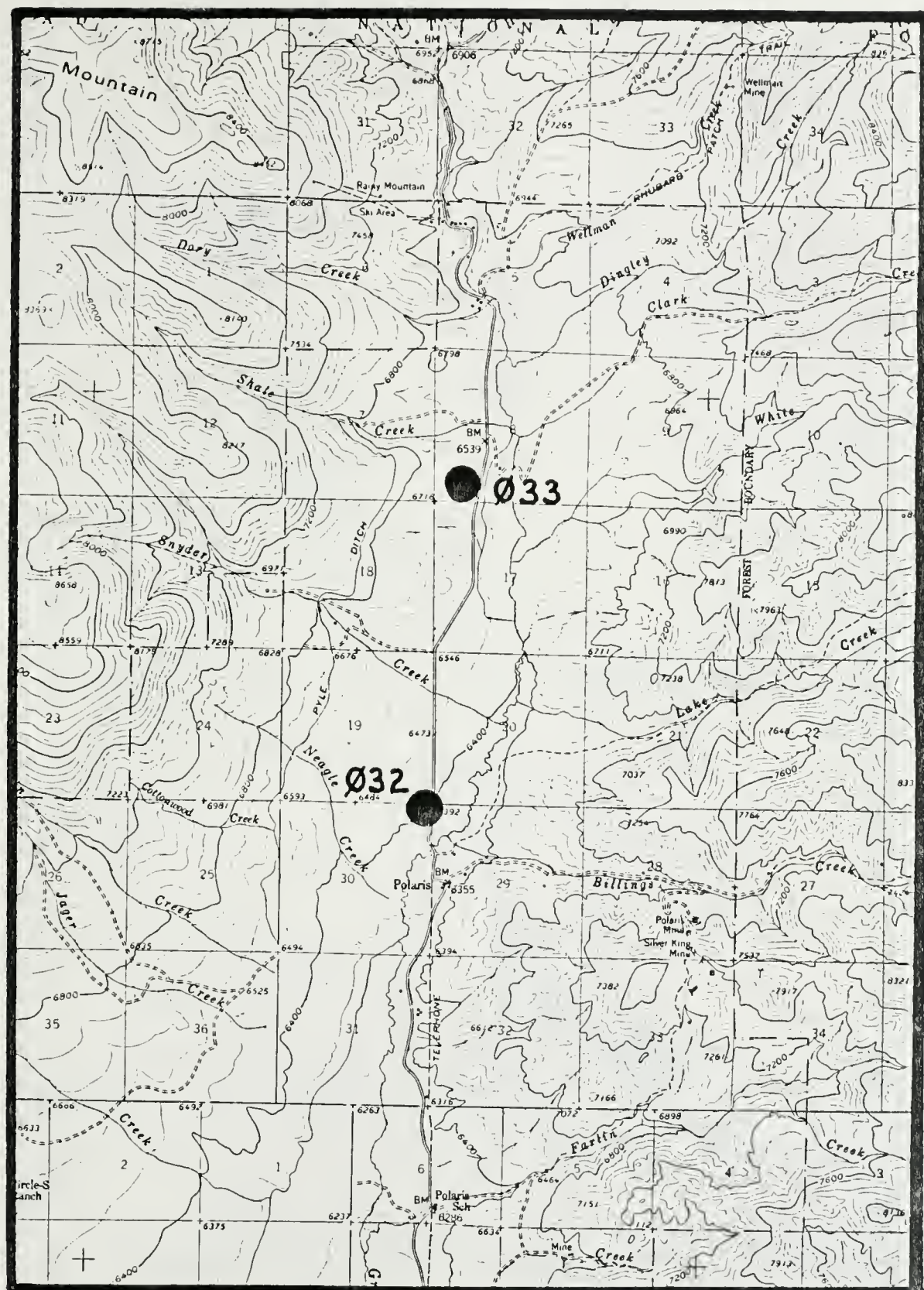


USGS Robbins Gulch Quadrangle (7.5')

Penstemon lemhiensis





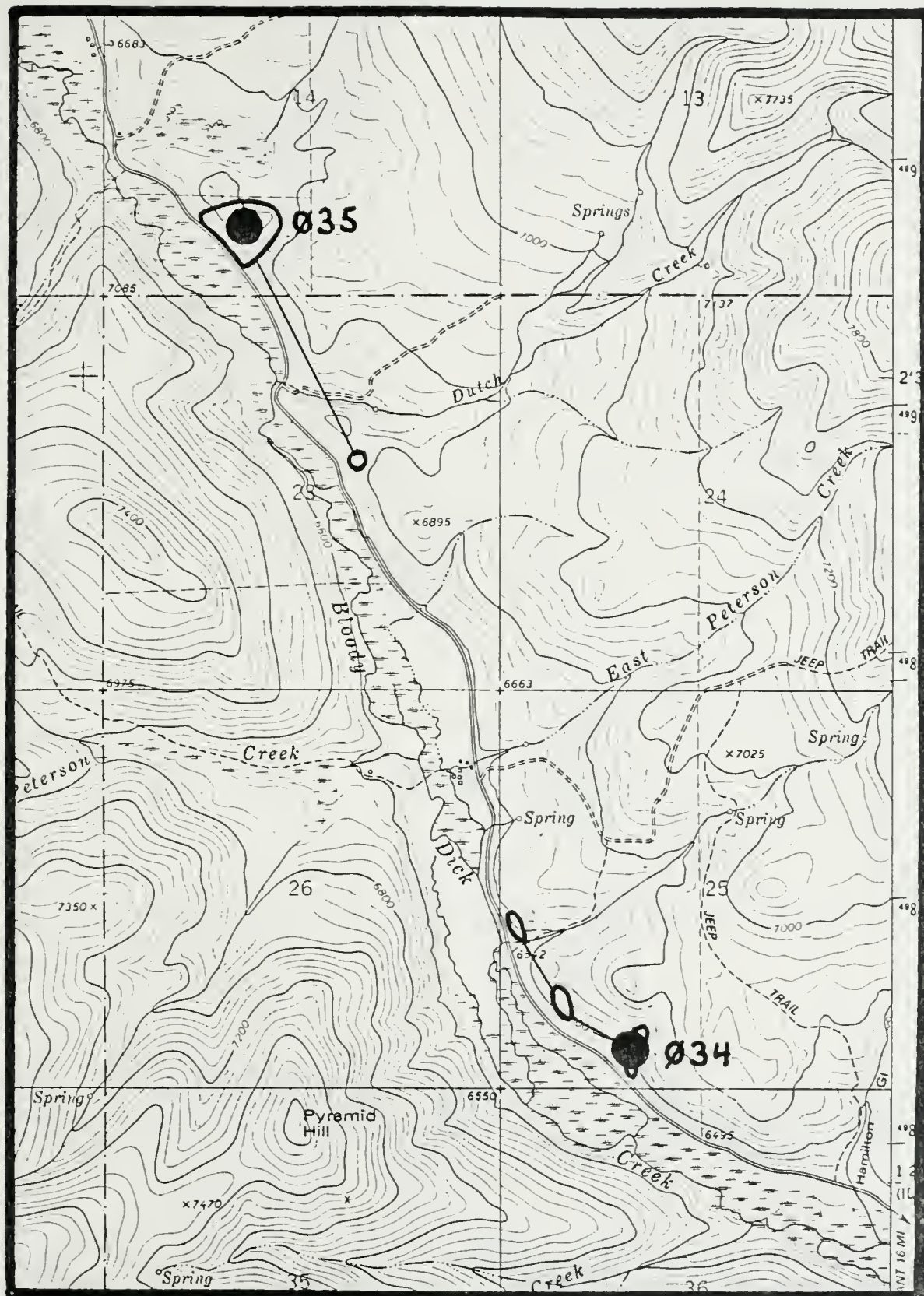


USGS Polaris Quadrangle (15')

Penstemon lemhiensis



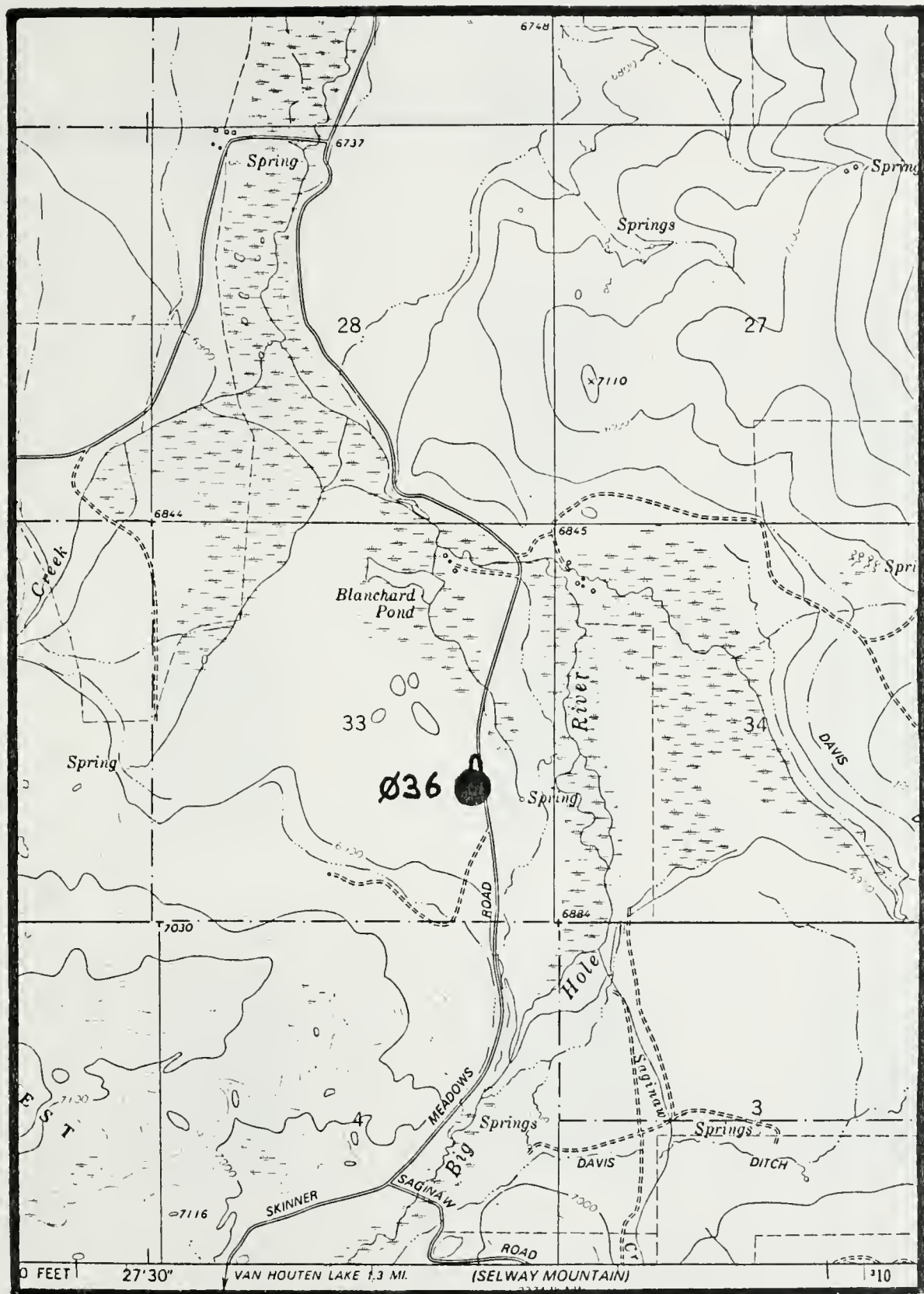




USGS Kitty Creek Quadrangle (7.5')

Penstemon lemhiensis





USGS Jackson Quadrangle (7.5')

Penstemon lemhiensis



## VI. PHOTOGRAPHIC SLIDES OF MONITORING TRANSECTS





PENSTEMON LEMHIENSIS  
Monitoring transect



Steve Shelly

French Creek - Park Mine  
View south → north  
7/27/89

1

PENSTEMON LEMHIENSIS  
Monitoring transect



Steve Shelly

French Creek - Park Mine  
View south → north  
7/27/89

2

PENSTEMON LEMHIENSIS  
Monitoring transect



Steve Shelly

French Creek - Park Mine  
View south → north  
7/27/89

3

PENSTEMON LEMHIENSIS  
Monitoring transect



MTNHP

Steve Shelly

French Creek - Park Mine  
View south → north  
7/27/89

4

PENSTEMON LEMHIENSIS  
Monitoring transect



Steve Shelly

French Creek - Discovery Mine  
View East → West  
7/27/89

5

PENSTEMON LEMHIENSIS  
Monitoring transect



Steve Shelly

French Creek - Discovery Mine  
View East → West  
7/27/89

6

PENSTEMON LEMHIENSIS  
Monitoring transect



Steve Shelly

French Creek - Discovery Mine  
View East → West  
7/27/89

7

PENSTEMON LEMHIENSIS  
Monitoring transect



MTNHP

Steve Shelly

French Creek - Discovery Mine  
View East → West  
7/27/89

8

PENSTEMON LEMHIENSIS  
Monitoring transect



Steve Shelly

Badger Pass North  
View West → East  
7/28/89

9

PENSTEMON LEMHIENSIS  
Monitoring transect



Steve Shelly

Badger Pass North  
View West → East  
7/28/89

10

PENSTEMON LEMHIENSIS  
Monitoring transect



Steve Shelly

Badger Pass North  
View West → East  
7/28/89

11

PENSTEMON LEMHIENSIS  
Monitoring transect



MTNHP

Steve Shelly

Badger Pass  
View West  
7/28/89

12





VII. APPENDIX. Performance of individual Penstemon lemhiensis plants in permanent monitoring transects.

FRENCH CREEK - PARK MINE

PLOT

1.   a.   R2  
     b.   R1  
     c.   R1  
     d.   R3-I1-F7
2.   NO PLANTS
3.   a.   R1  
     b.   R1  
     c.   S  
     d.   R1  
     e.   R1  
     f.   R1-I1-F2  
     g.   R1
4.   a.   S  
     b.   R1  
     c.   R3  
     d.   R1  
     e.   R2
5.   a.   R2  
     b.   R1
6.   a.   R4  
     b.   R1  
     c.   S  
     d.   R1-I1-F2
7.   a.   R1  
     b.   R1  
     c.   R1  
     d.   R1
8.   a.   S  
     b.   R2  
     c.   R1
9.   a.   R3-I2-F5  
     b.   R6  
     c.   R10-I1-F11
10.  a.   R10-I4-F35-B1  
     b.   R3-I1-F11  
     c.   R3-I3-F13  
     d.   R3  
     e.   R2



- f. R1
  - g. R5-I1-F6
  - h. R1
  - i. R1
  - j. R8-I2-F31
11. a. R6-I1-F5
- b. R2
- c. R6
- d. R3
- e. R8-I1-F20-B1
- f. R1
- g. R12-I1-F18
- h. R4-I2-F19
12. a. R2-I2-F35
- b. R4
- c. R4-I2-F39
- d. R5-I1-F13
- e. R3-I1-F7
13. a. R7-I2-F17
14. a. R2
- b. R5-I1-F12
15. a. R5
16. a. R7-I2-F22
17. a. R1 (dying)
- b. R3
- c. R2-I1-F7
- d. R5
18. a. R5-I1-F16
- b. R7-I3-F29
- c. R3
19. a. R7
- b. R5
- c. R4-I1-F21
- d. R4
- e. R10-I1-F13-B5
- f. R8-I4-F61
20. a. R4-B1
21. NO PLANTS
22. a. R2
- b. R4
23. a. R1
- b. R6-B1-F1



- c. R1-I1-F3
- d. R1
- e. R3
- f. R4-B1
- g. R3

24. NO PLANTS

- 25.
- a. R1
  - b. R11
  - c. R7-B1
  - d. R9-B2
  - e. R3





## FRENCH CREEK - DISCOVERY MINE

## PLOT

1.
  - a. R4-B3
  - b. R3-B2
  - c. R3
  - d. R3
  - e. R2
  - f. R4-B1
  - g. R2
  - h. R1
  - i. R8-B2
  - j. R1
  - k. R2
  - l. R1
  - m. R4-B2-F2
  - n. R1
  - o. R2
  - p. R4-B1
2.
  - a. R1
  - b. R6-B4
  - c. R6-I1-F1
3. NO PLANTS
4. NO PLANTS
5. NO PLANTS
6.
  - a. R4-B1
  - b. R4-I1-F6
7.
  - a. R1
  - b. R2-I1-F20
  - c. R1
  - d. R5-B1-F1
8. NO PLANTS
9.
  - a. R6-I4-F7-B2
10. NO PLANTS
11. NO PLANTS
12. NO PLANTS
13. NO PLANTS
14. NO PLANTS
15. NO PLANTS



- 16.   a.   R4  
      b.   R8-I4-F29
- 17.   NO PLANTS
- 18.   NO PLANTS
- 19.   NO PLANTS
- 20.   NO PLANTS
- 21.   NO PLANTS
- 22.   NO PLANTS
- 23.   a.   R3-I1-F31
- 24.   a.   R4
- 25.   a.   R2  
      b.   R3  
      c.   R5  
      d.   R1  
      e.   R5-B1



## BADGER PASS NORTH

## PLOT

1.
  - a. R3
  - b. R6-I2-F17-A64 (unknown whether many of the 64 "aborted" fruits may in fact develop)
  - c. R1
  - d. 9 seedlings (centered at 2.5/2.5)
  - e. R3-I1-F11-A11
  - f. R3
  - g. R3
  - h. S
  - i. R5
  - j. R6
2.
  - a. S
  - b. S
  - c. S
  - d. R2
  - e. R5
  - f. R2
  - g. R2
  - h. R2
  - i. R1
  - j. R2
  - k. C
  - l. R2
  - m. C
  - n. R8
3.
  - a. R2
  - b. R7
  - c. R1
  - d. R5-I1-F8-A19
  - e. R5-I2-F17-A25

## PLOTS 4-27: NO PLANTS

28.
  - a. R7-I3-F27-A15
  - b. R3
29.
  - a. R2
30.
  - a. R4-I1-F3-A23
  - b. R2
31.
  - a. R3-I1-F8-A16
  - b. R7-I1-F23-A11
  - c. C
  - d. R5-I1-F27-A10
32. NO PLANTS
33.
  - a. R3-I1-F9-A6-B1



34. NO PLANTS
35. a. R1  
b. R5
36. a. R8  
b. R2  
c. C  
d. R7 (taproot unearthed)
37. a. R3  
b. R3  
c. R6  
d. R3  
e. R7  
f. R3  
g. R6
38. a. R1  
b. R9  
c. R1  
d. R6  
e. R4  
f. R4  
g. R11  
h. R9-I1-F12-A12
39. a. R6  
b. R2  
c. R1  
d. R2  
e. R3  
f. R3  
g. R1-I1-F14-A22  
h. R5+  
i. R2  
j. R5-I2-F16-A64  
k. R1-I1-F13-A17  
l. R7-I1-F29-A12  
m. R6  
n. R6
40. a. R1  
b. R2-I1-F0-A34  
c. R5-I1-F18-A15  
d. R4  
e. R5  
f. R3  
g. R1  
h. R4-I2-F11-A15  
i. R6-I2-F31-A16  
j. R5  
k. R13  
l. R6





- m. R2
  - n. R5
  - o. R5
  - p. R3
  - q. R2
41. a. R3  
b. R4-I1-F25-A27  
c. R4  
d. R15<sub>±</sub>  
e. R16
42. a. R4  
b. R5-I2-F41-A20
43. a. R8  
b. R1  
c. R6-I1-F29-A3  
d. R9-I2-F30-A18  
e. R4
44. a. R10  
b. R8
45. NO PLANTS
46. NO PLANTS
47. NO PLANTS
48. a. R1  
b. R2  
c. R8-I1-F22-A10
49. NO PLANTS
50. a. R4





